No. 7. Vol. 5.
(New [illegible]ies. No. 3. Vol. I.)

SIXPENCE.
(Registered as a Newspaper.)

Friday,
October 28, 1904.

V 7 1904
OF TORONTO

PAGE'S WEEKLY

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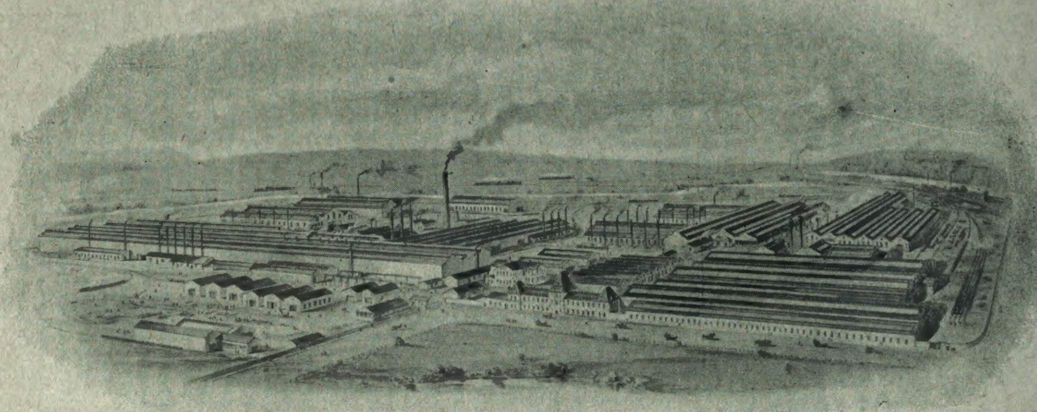

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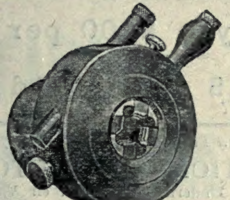

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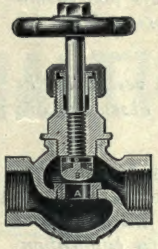

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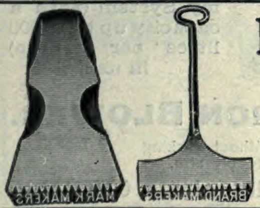

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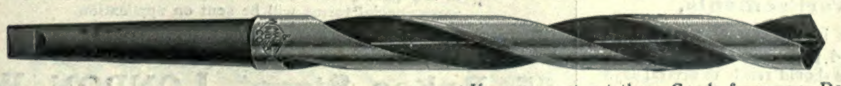

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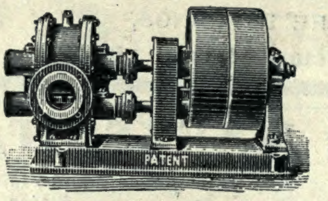

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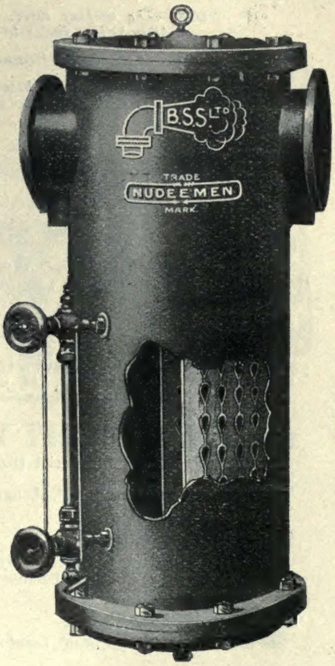

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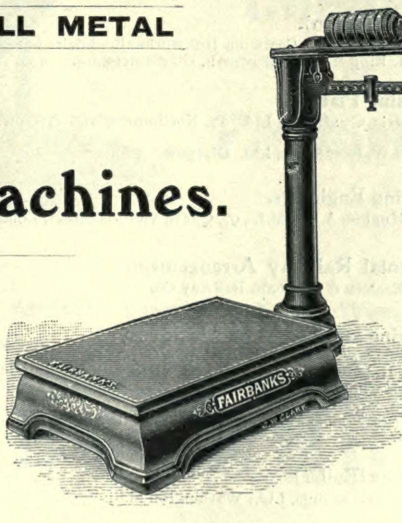

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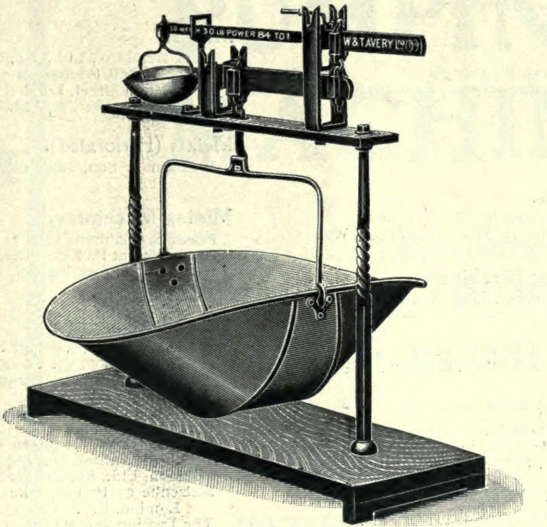

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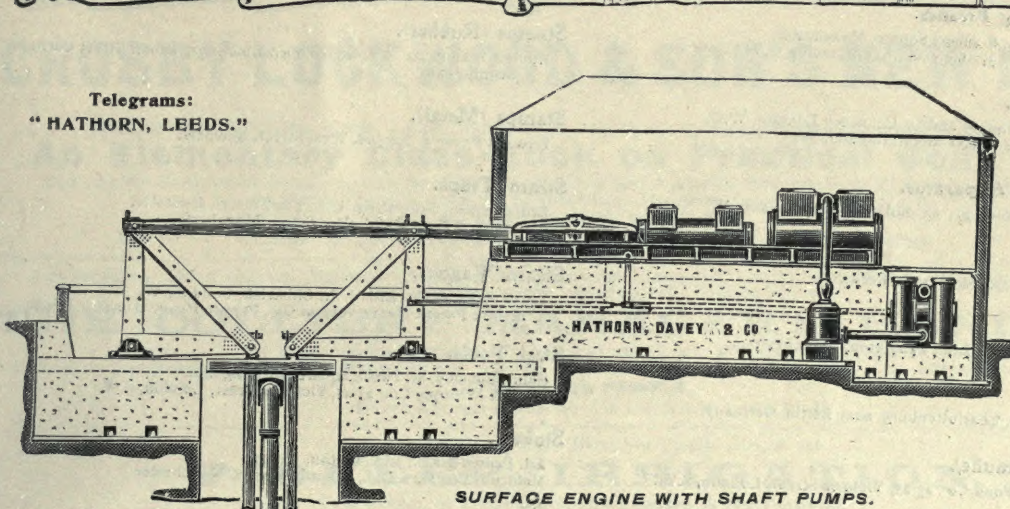

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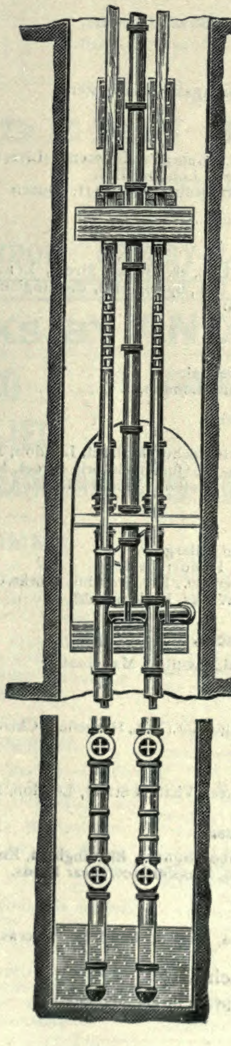

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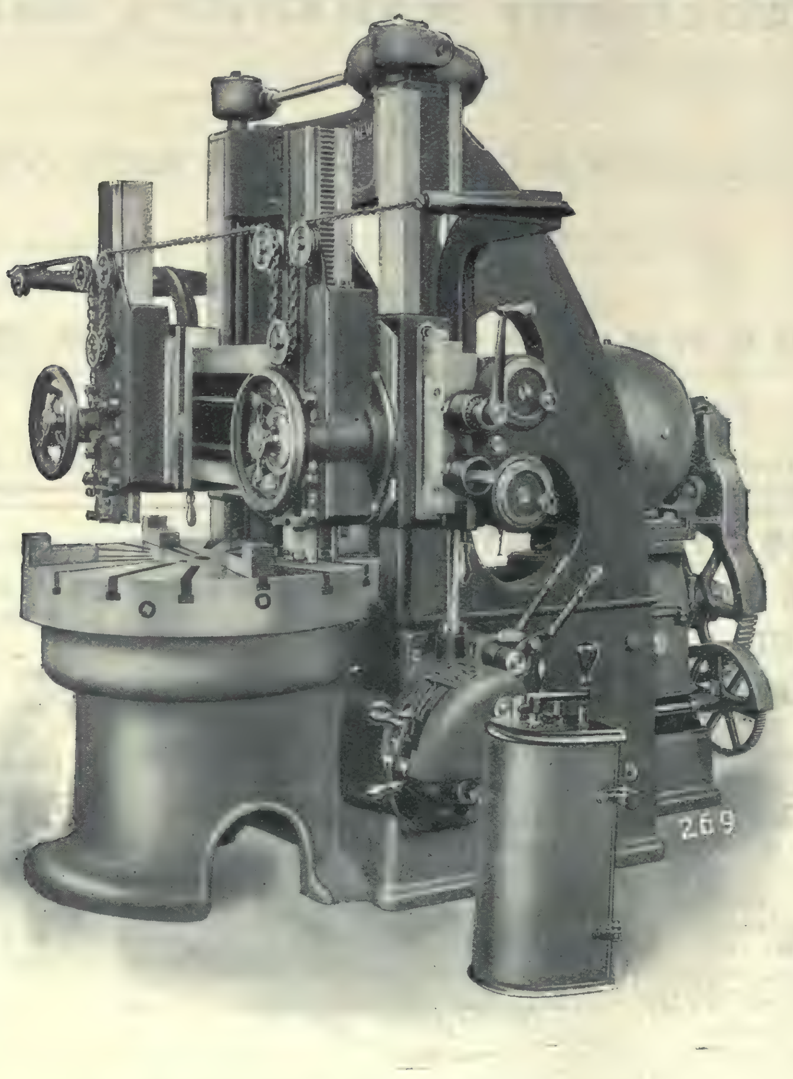

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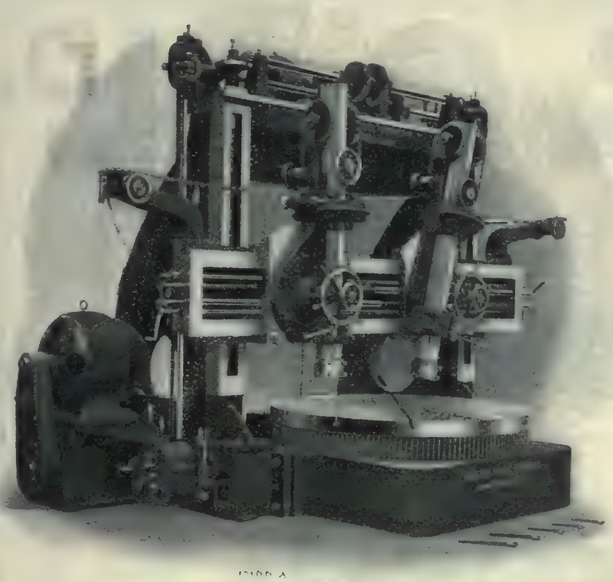

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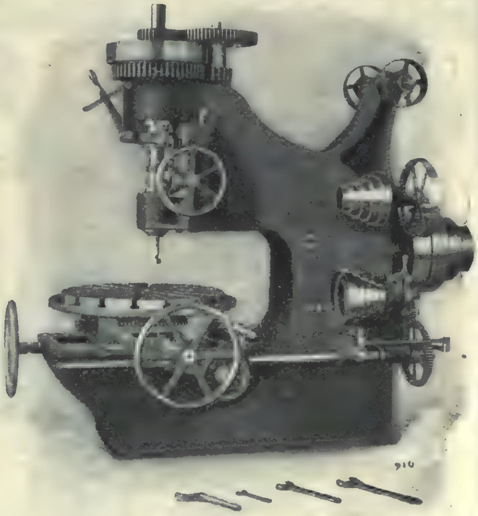

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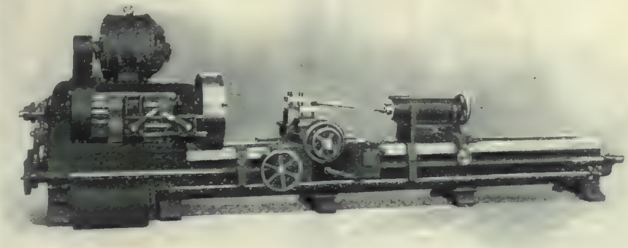

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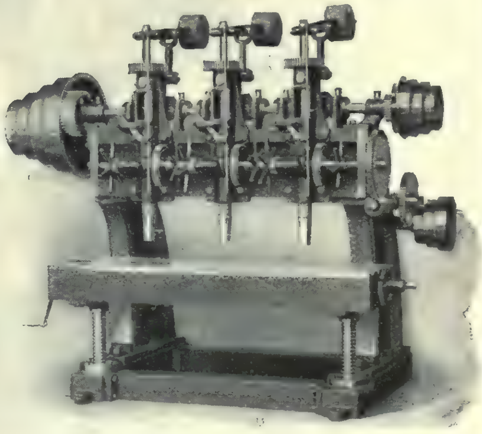

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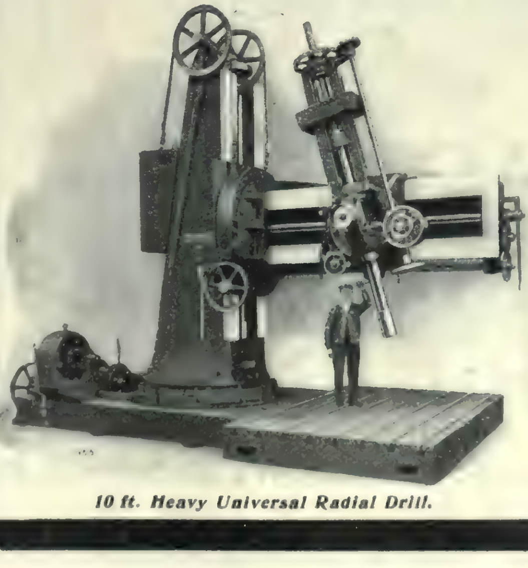

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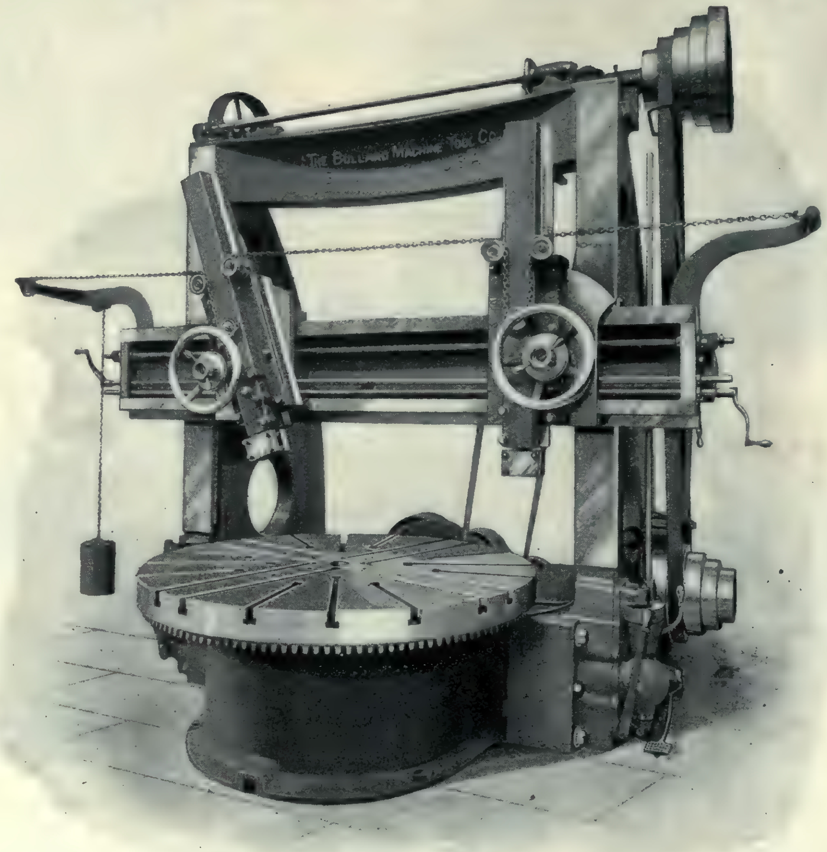

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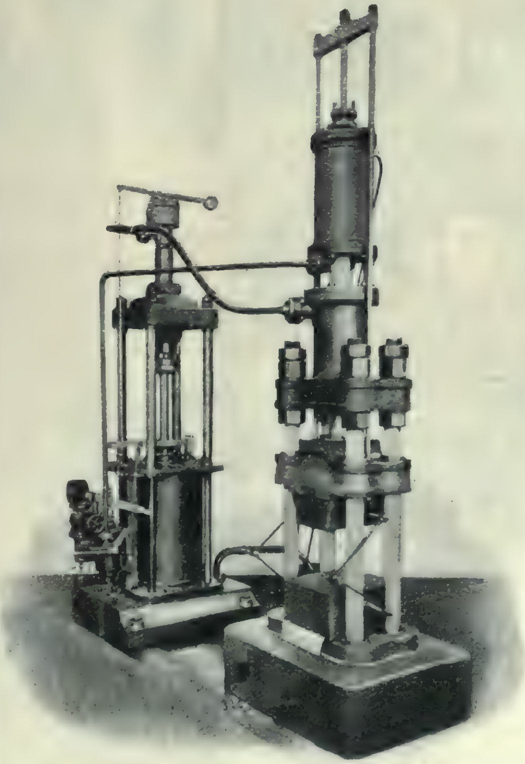

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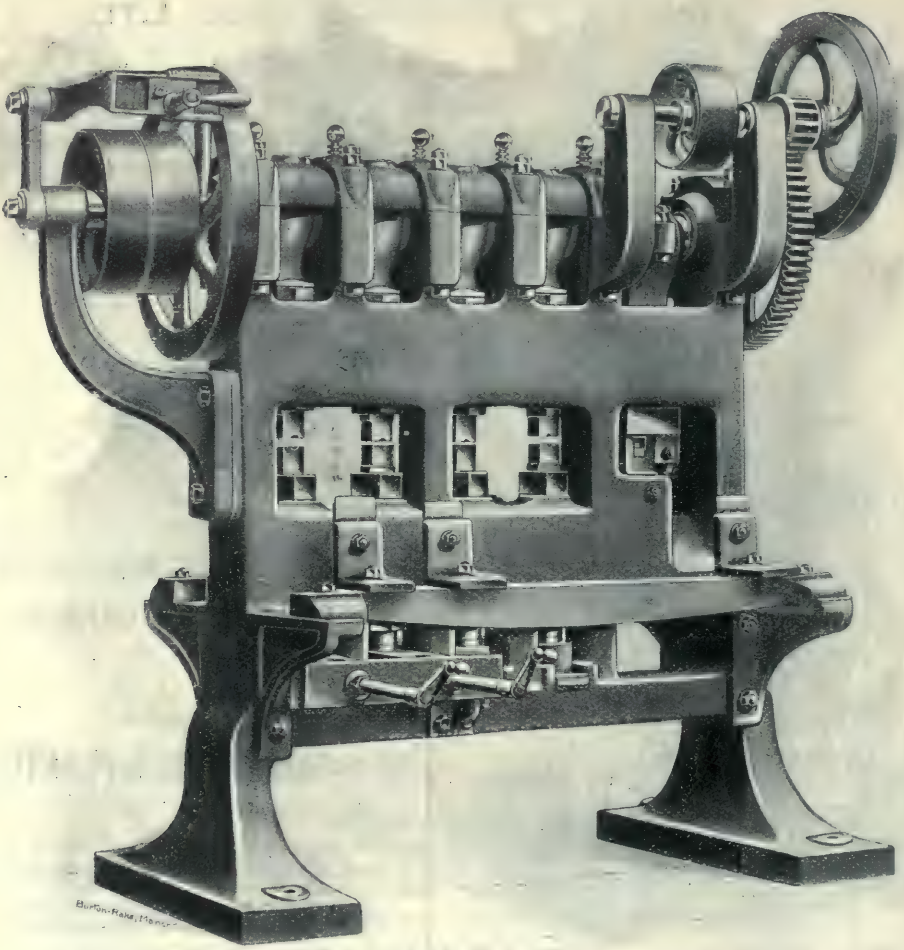
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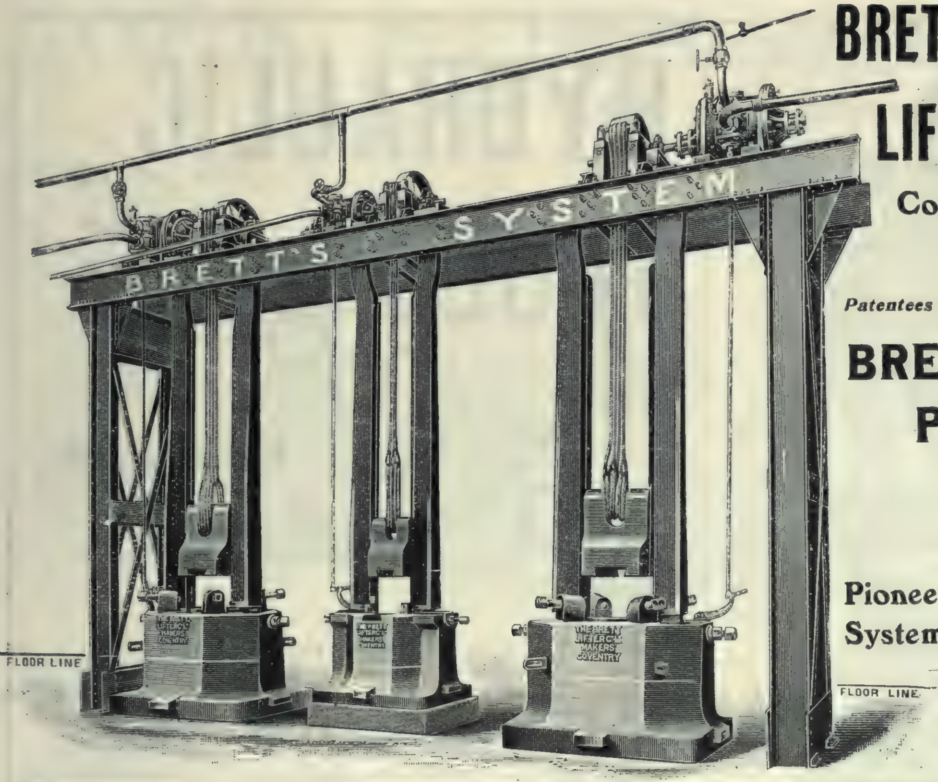
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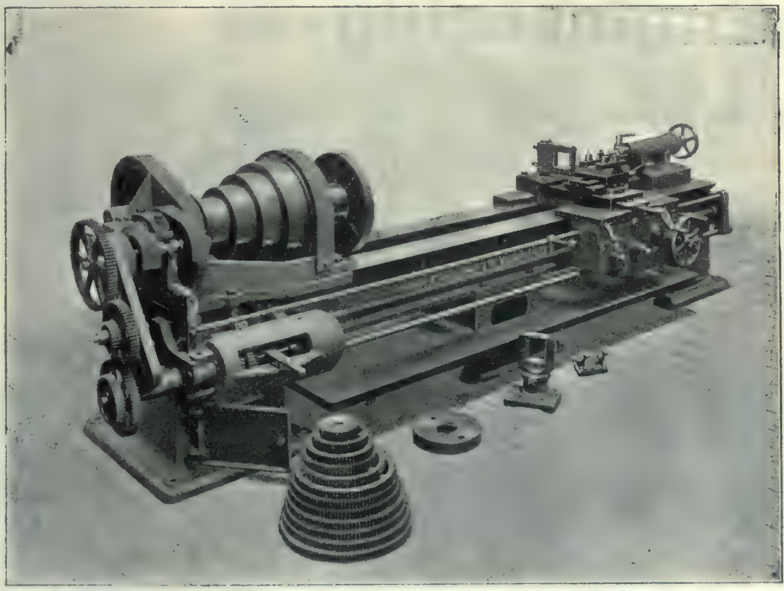

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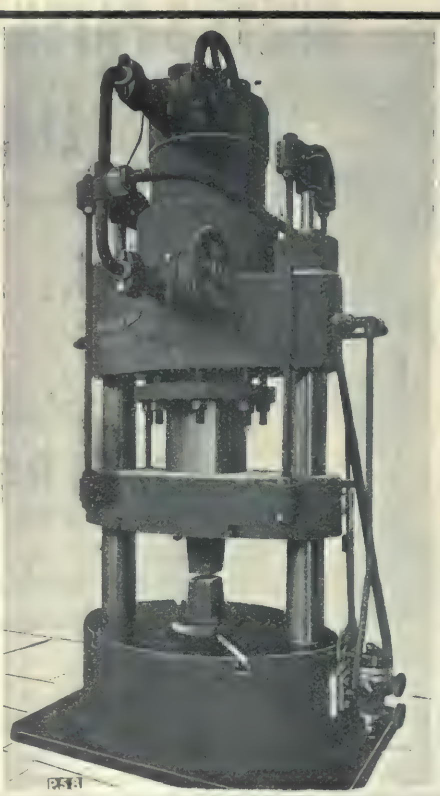

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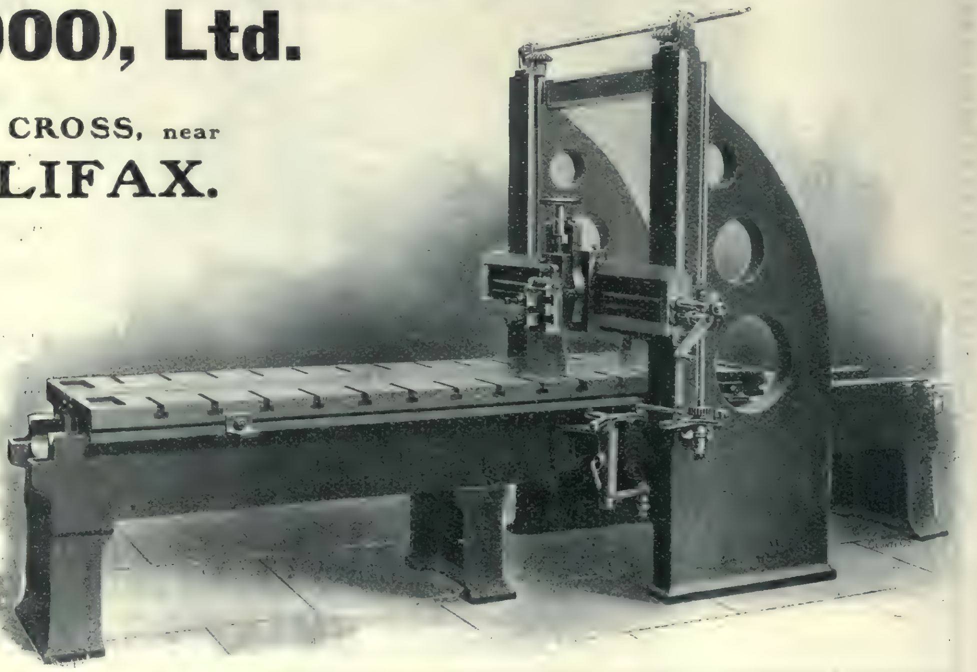

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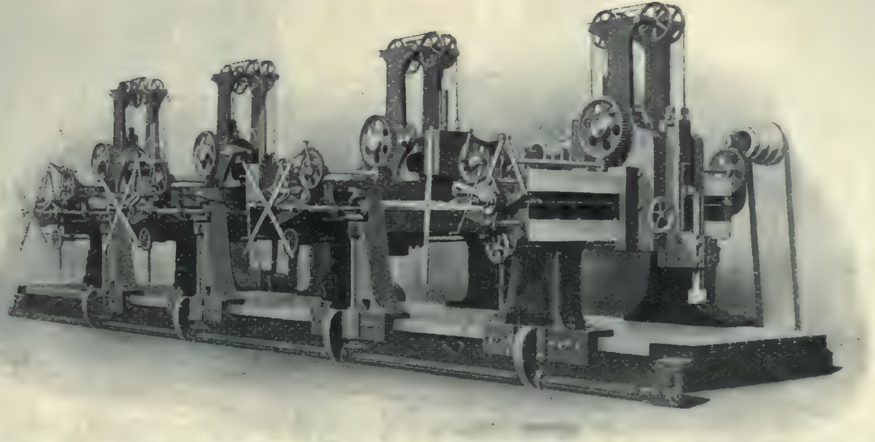

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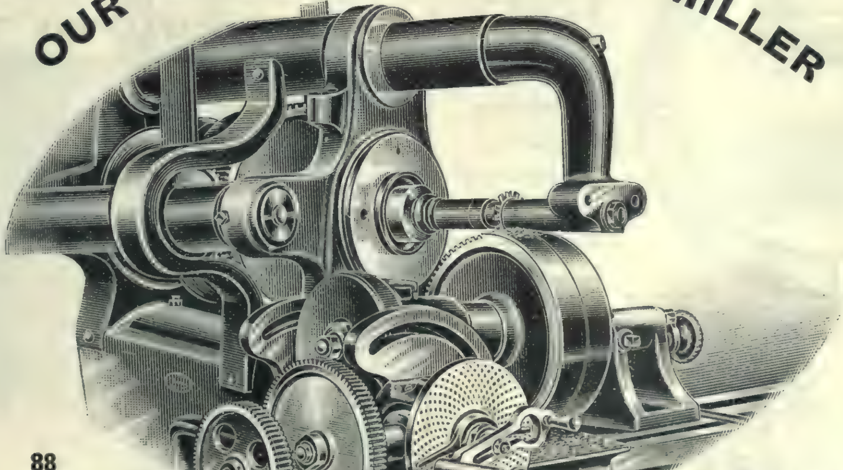

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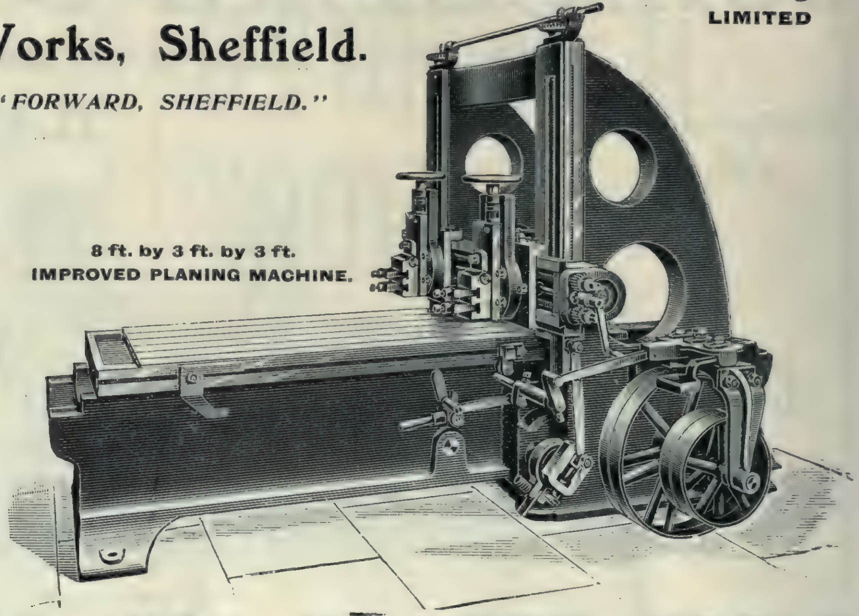

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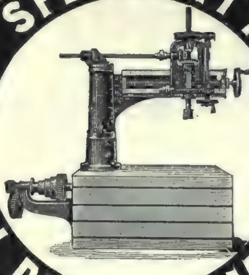

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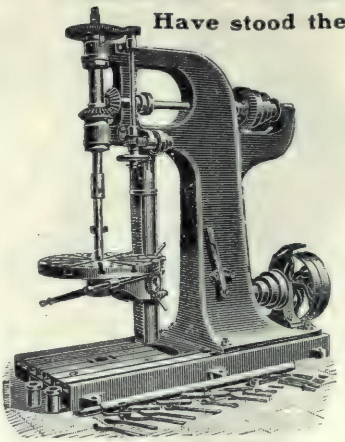

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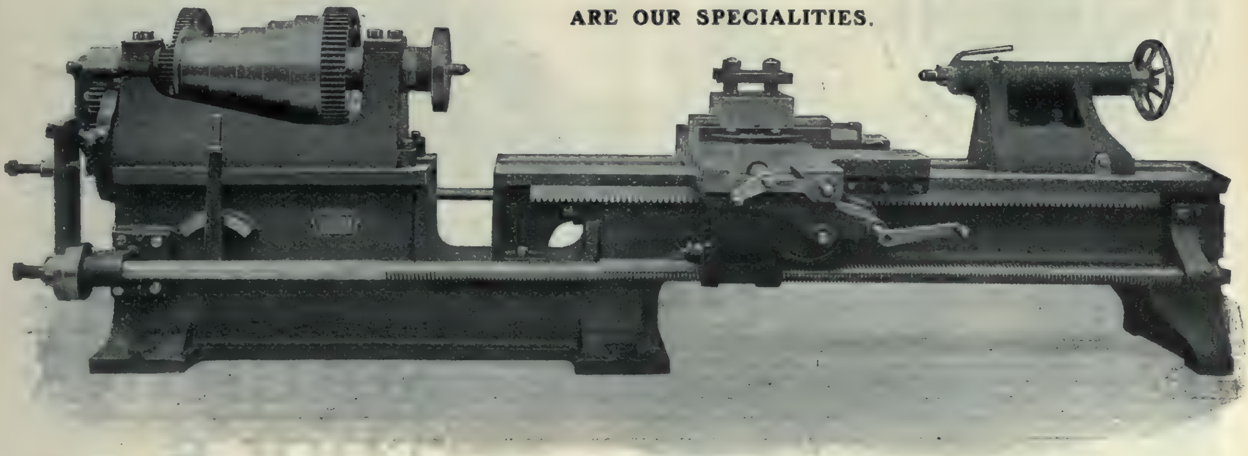

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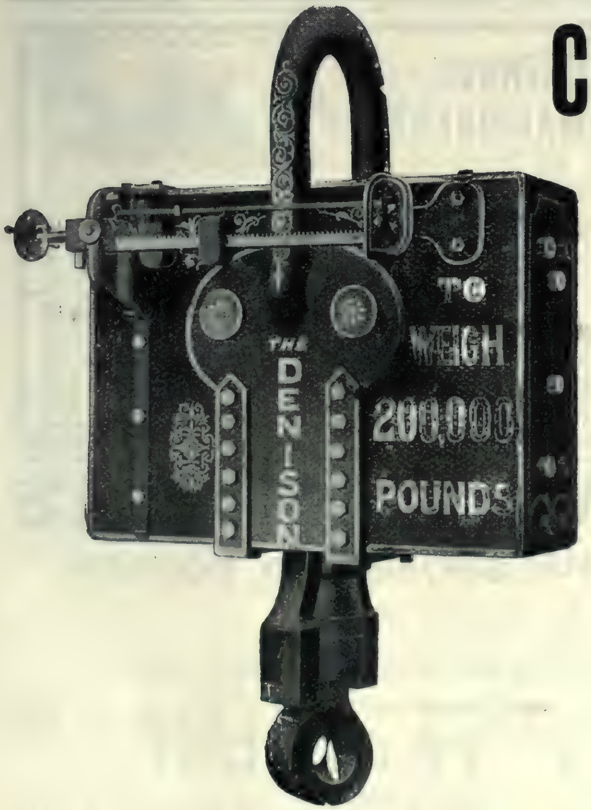

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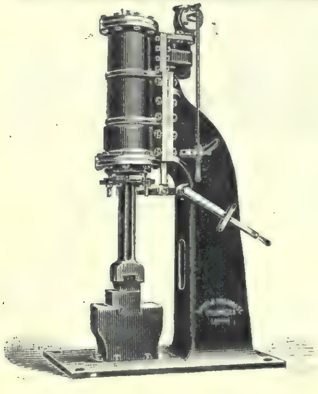

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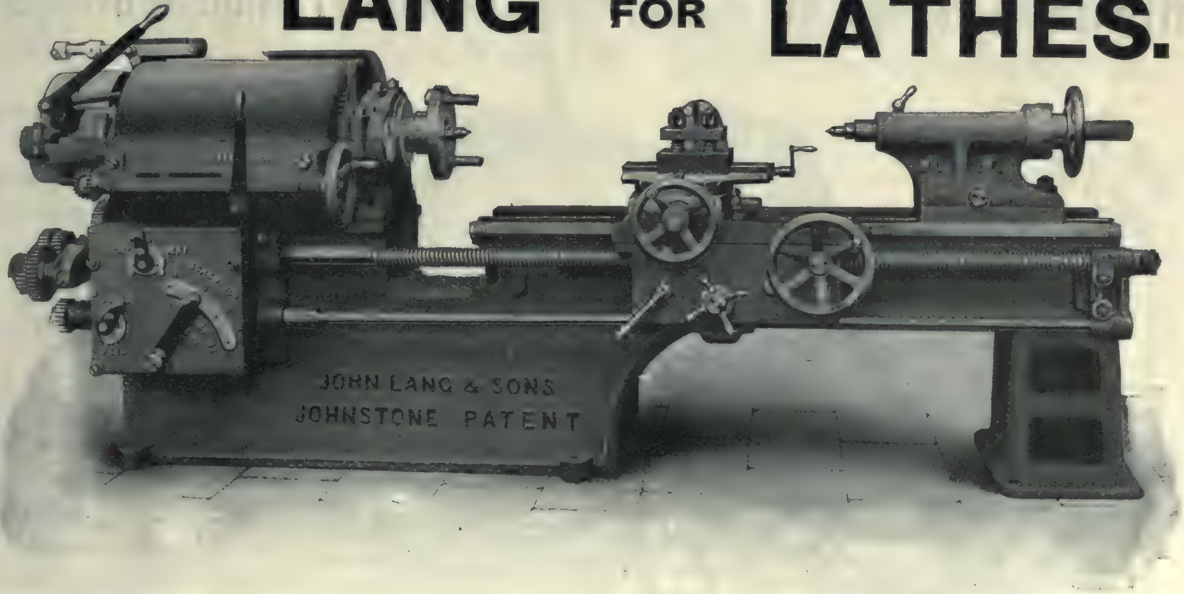

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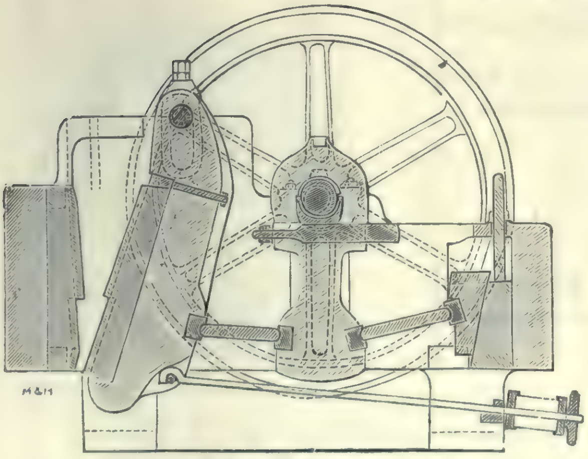

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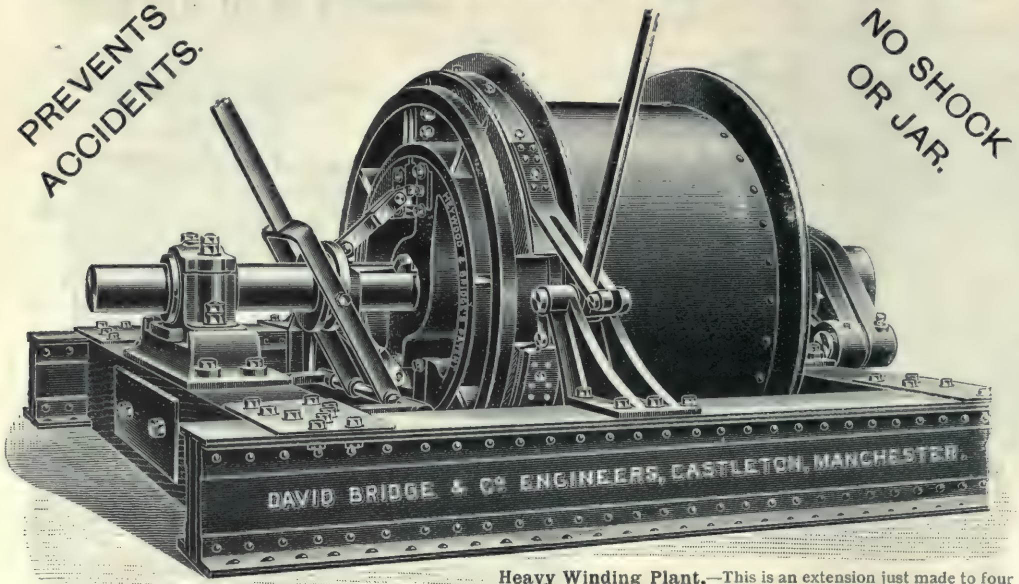
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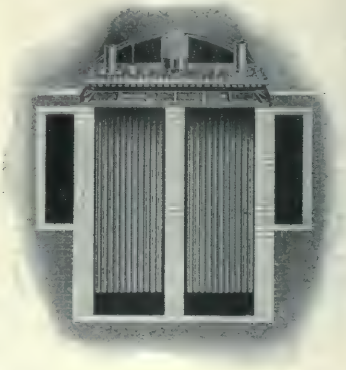

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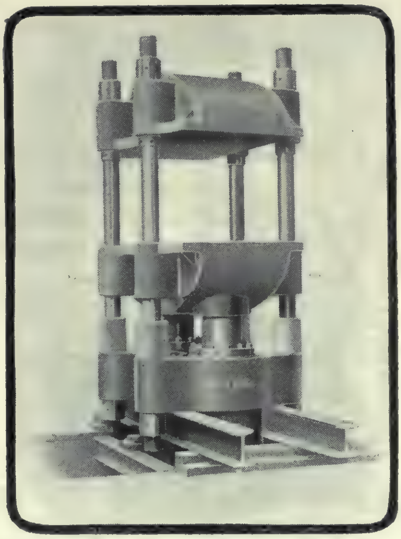
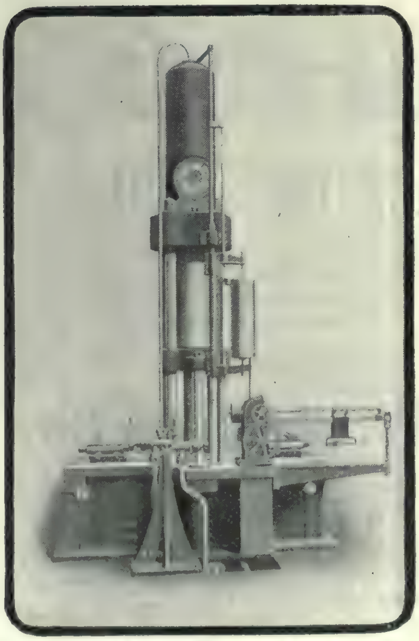
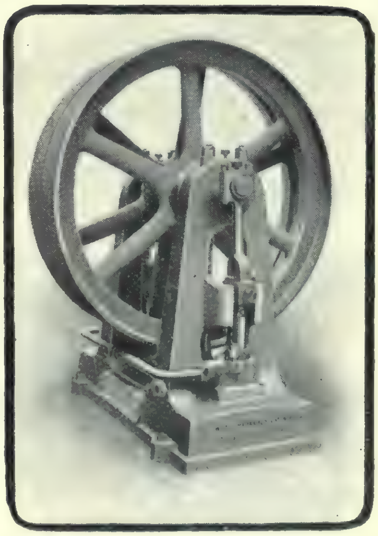


500 Ton Hydraulic Press.



Patent Spring-Testing Machine.



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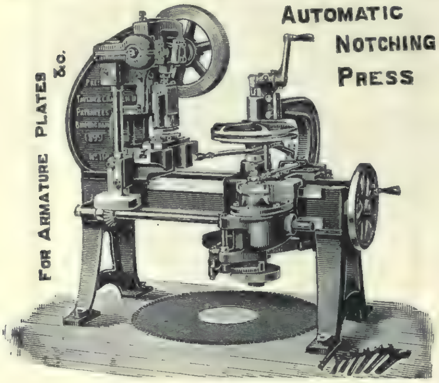

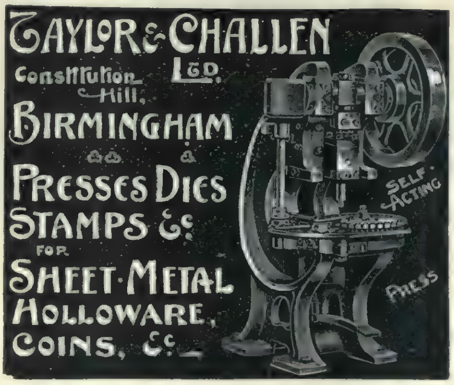

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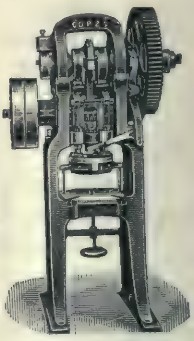

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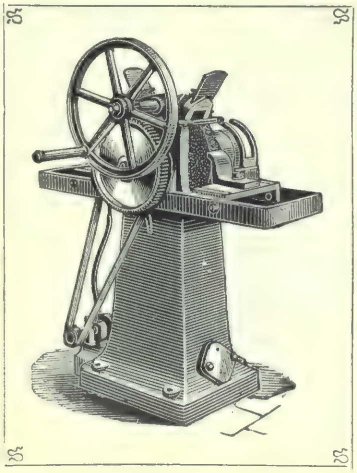

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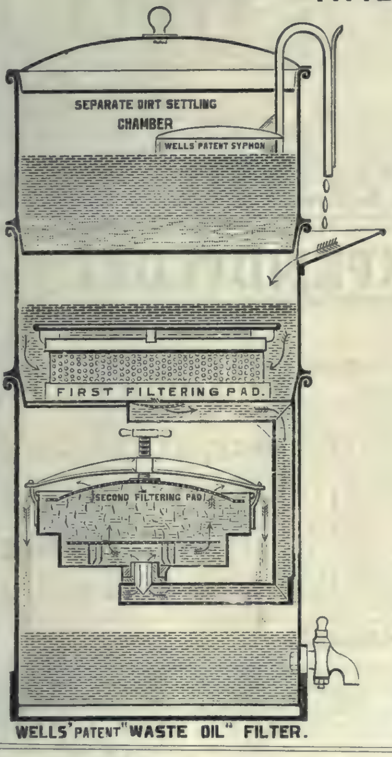

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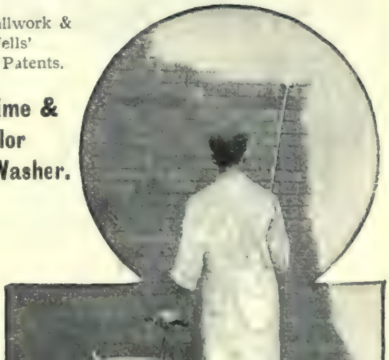

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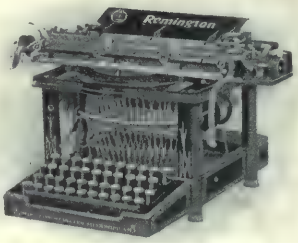

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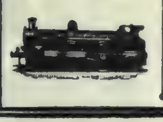

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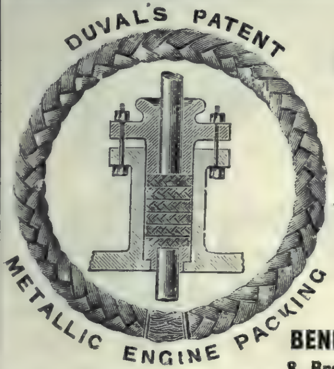

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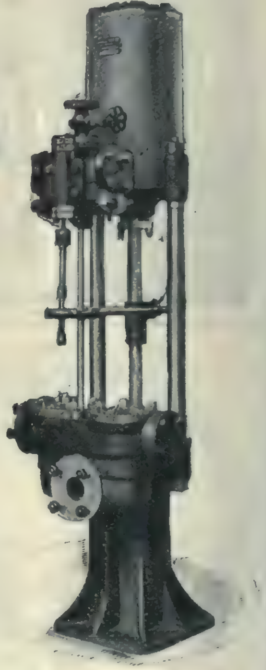

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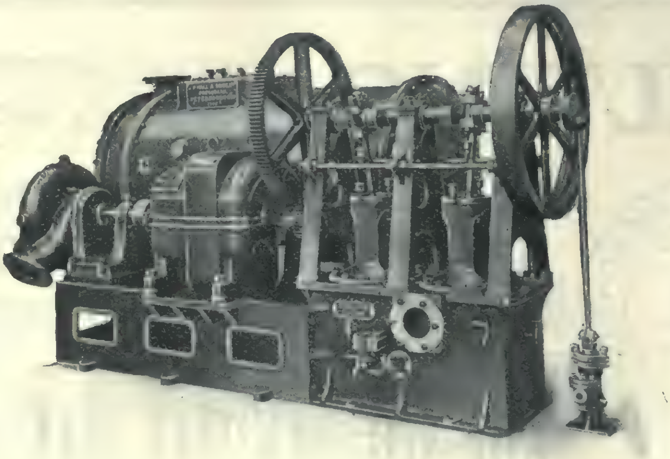

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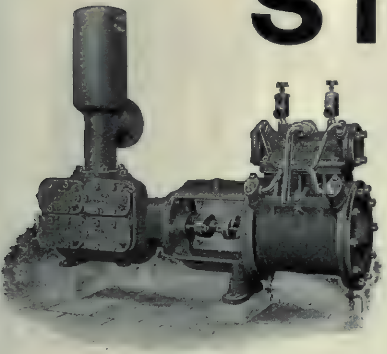
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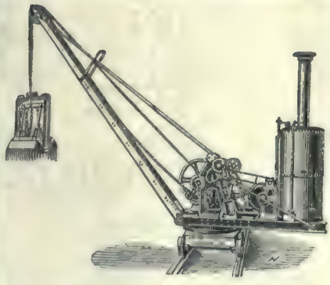
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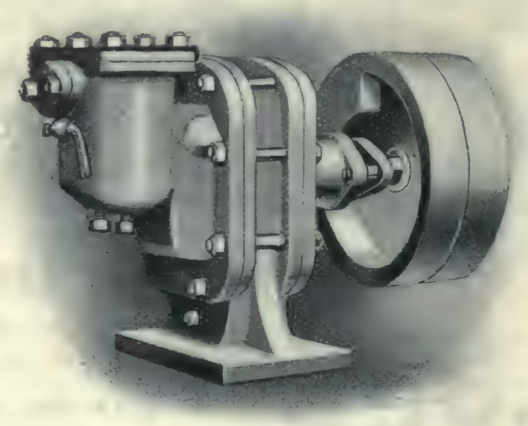

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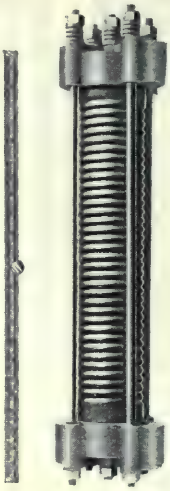

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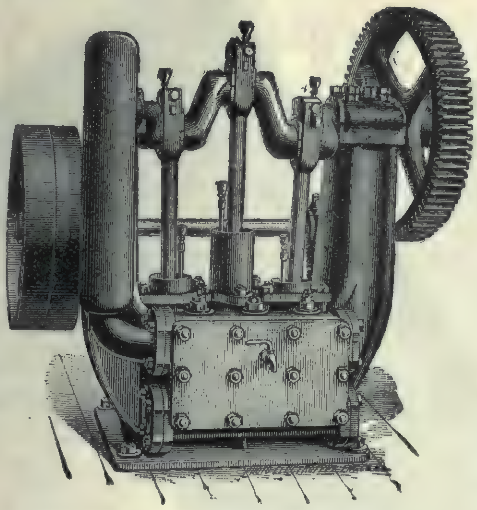

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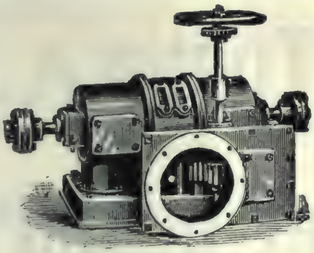

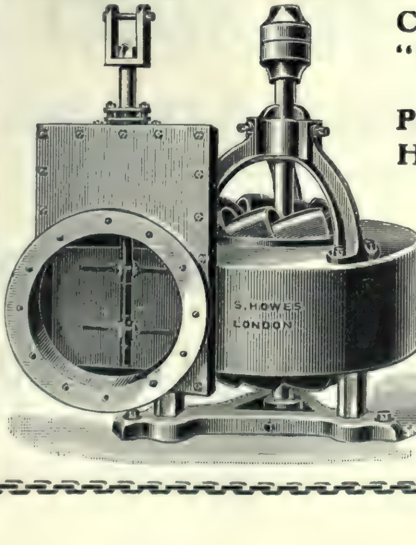

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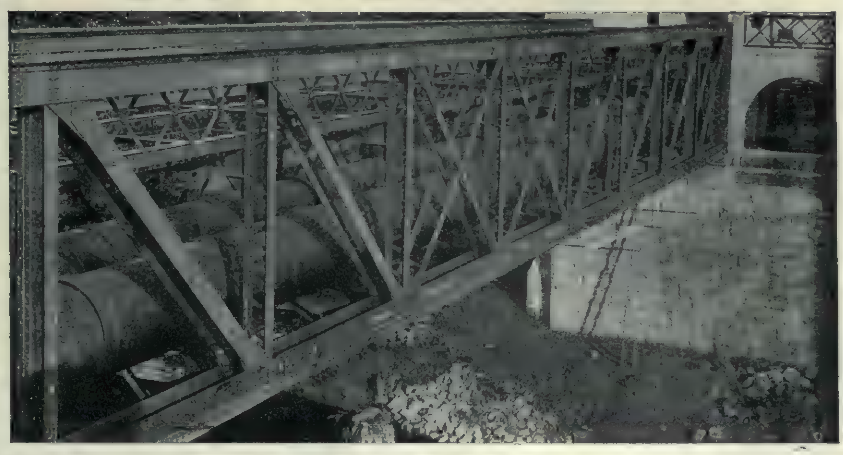

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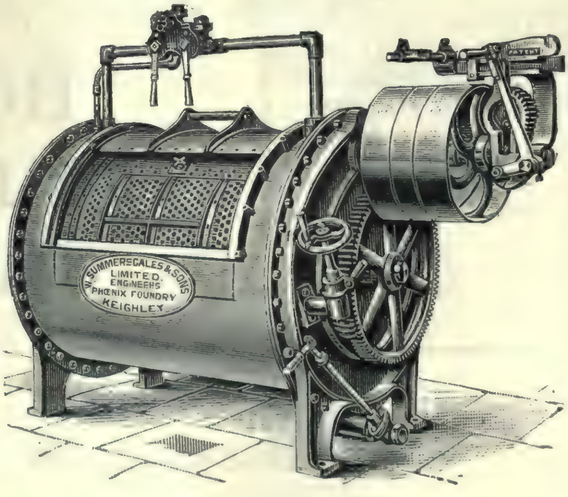

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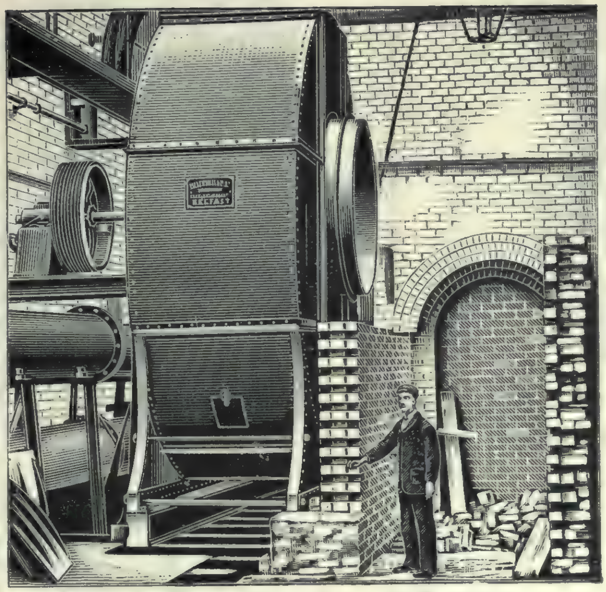

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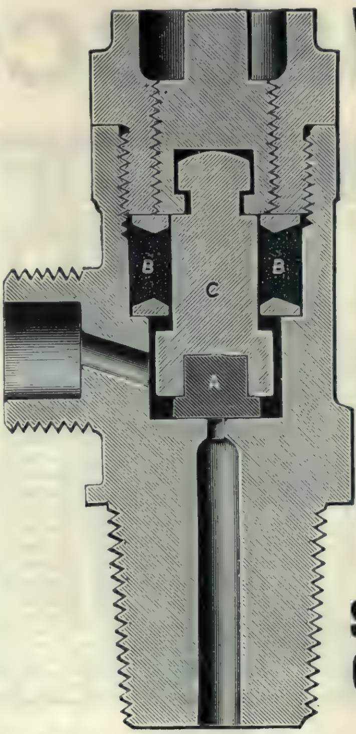

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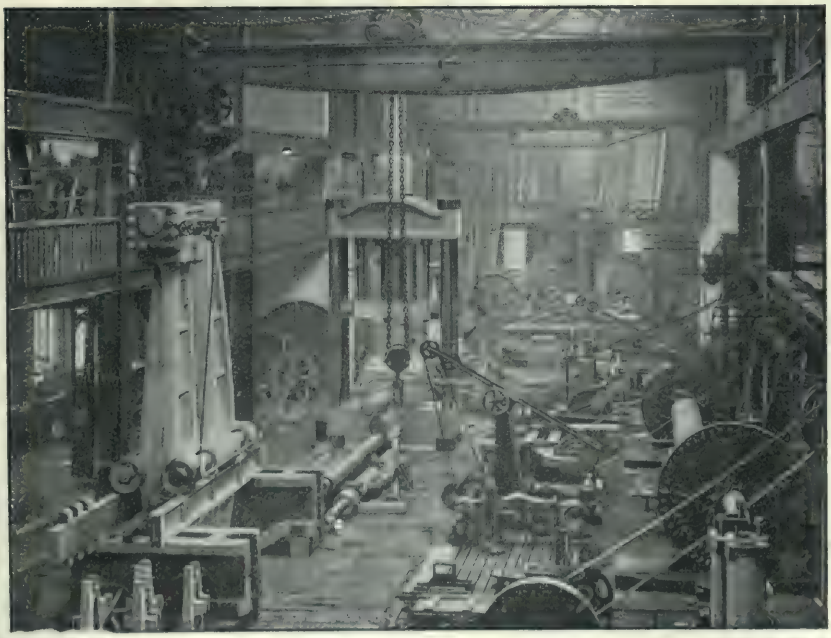

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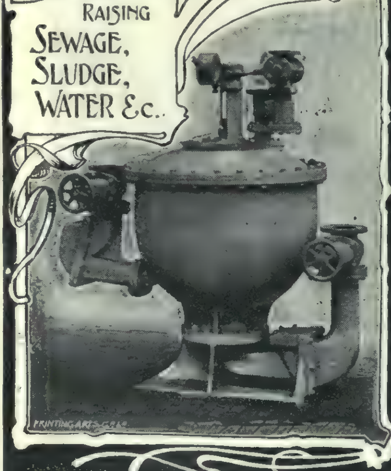

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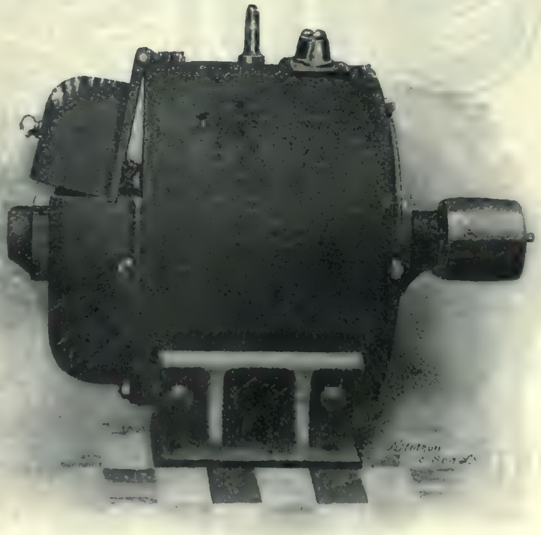

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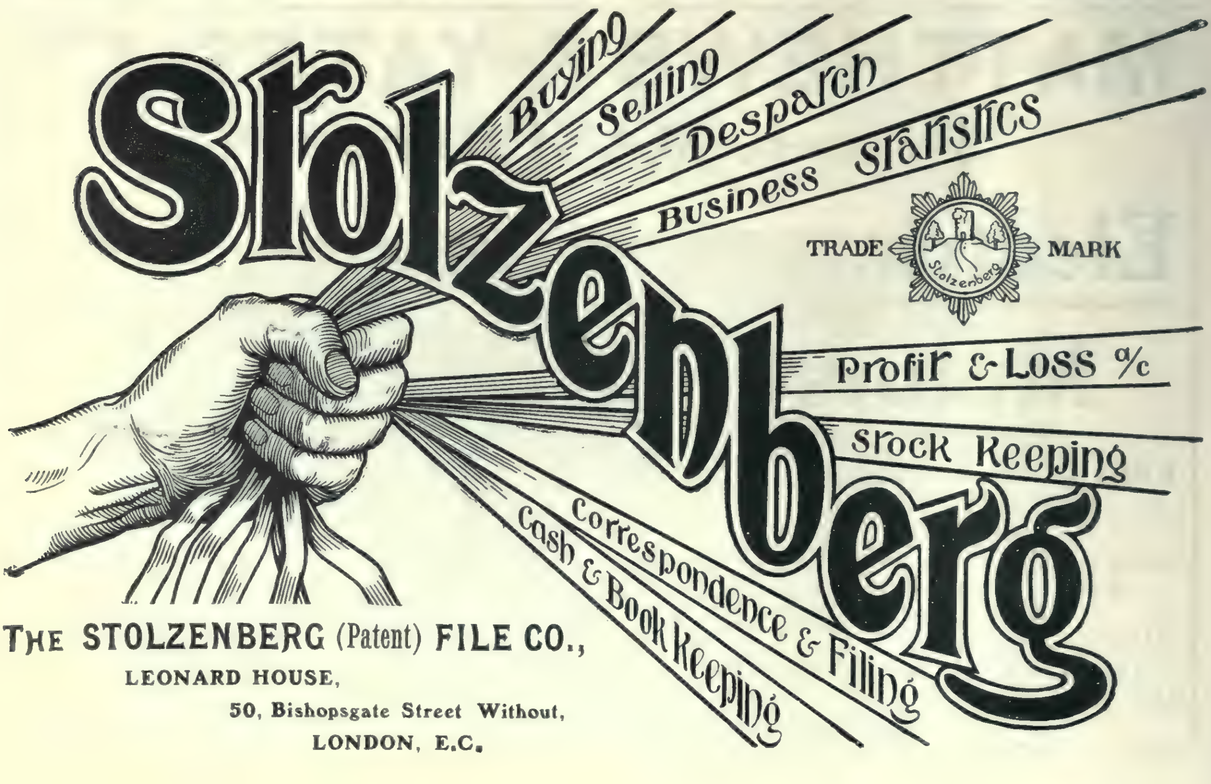

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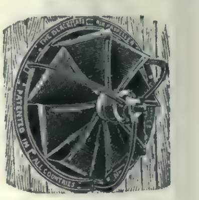

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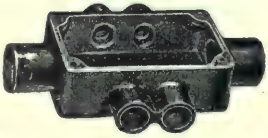

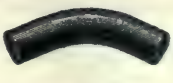

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PAGE'S WEEKLY Magnolia Metal

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This illustration is of a Steam Wagon to carry 6 Tons and haul 4 Tons on a Trailer.

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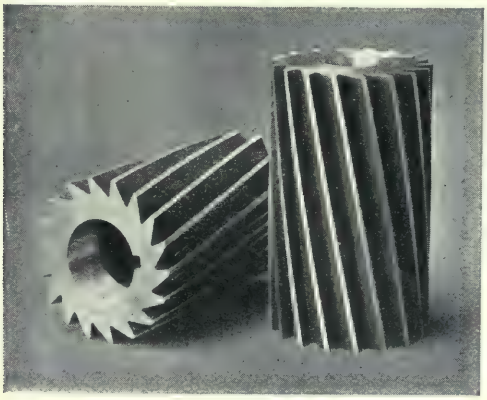

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Ordinary Steel.

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PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Shipbuilding, Iron and Steel, Mining and Allied Industries.

VOL. V. LONDON, FRIDAY, OCTOBER 28, 1904. No. 7.

The Offices of "Page's Weekly," Wednesday, 11 p.m.

THE suggestion that the officers in command of the Russian Baltic Fleet mistook the Hull fishing boats for a hostile but masked demonstration seems hardly tenable. If it were, nothing but disgraceful ineptitude and cowardice could have blinded the Russians. The veriest tyro would be prepared at sight to discriminate between a torpedo-boat and a fishing smack; moreover, torpedo vessels in action do not show the Board of Trade lights, and it is inconceivable that the officers of the Baltic Fleet could have supposed that a torpedo attack would be delivered without the slightest attempt of concealment. We hear that the search lights of the Russian warships threw into high relief every detail of the fishing operations in progress and that the men of the Hull fleet were to be seen in the act of gutting the fish. It is very difficult to believe, in the light of the information to hand, that the Russian officers made a mistake or were ignorant of what they were doing. The supposition that they were intoxicated has been put forward, and is a possible but not a probable explanation of the affair.

Apart from committing one of the most unjustifiable crimes in history, the Baltic fleet has already met with an extraordinary series of mishaps, notwithstanding the fact that it is expected to do great things. There are those who do not hesitate to say that it is

VICE-ADMIRAL LORD CHARLES BERESFORD.

In supreme command of the Channel Fleet, consisting of Eight Battleships of the first-class and similar design, forming a homogeneous force: *Cæsar*, *Hannibal*, *Illustrious*, *Jupiter*, *Magnificent*, *Majestic*, *Mars*, and *Victorious*; four protected cruisers: *Doris*, *Endymion*, *Hermes*, and *Theseus*.

not intended ever to reach Eastern waters; that, in short, the Baltic fleet is merely playing a game of bluff. If this is so, the officers in command have certainly sought an extraordinary method of securing their own recall.

There is of course, still another possible motive on the part of the commanders of the Baltic fleet which must be carefully weighed, *i.e.*, that, mistaking the patience of the British nation over the previous unwarrantable interference with our shipping, the action of the Baltic fleet was deliberately provocative. This of course, needs to be carefully weighed. Under existing circumstances, when Russia has her hands so full, it is scarcely probable that she would wish to extend the conflagration of war to her own borders. I am inclined to think that after considering the various possible motives outlined, we must attribute the outrage to the bungling and inefficiency which has been so characteristic of Russian naval affairs.

The question of motives apart, Great Britain insists upon apology, reparation, and the punishment of those responsible. Already the Czar has expressed his personal regret, but a few polite words will not compensate for atrocities committed upon British subjects. Our naval organisation is happily prepared and the Admiralty make the significant announcement that preliminary orders for mutual support and co-operation have been issued, as a measure of precaution, to the Mediterranean, Channel, and Home Fleets.

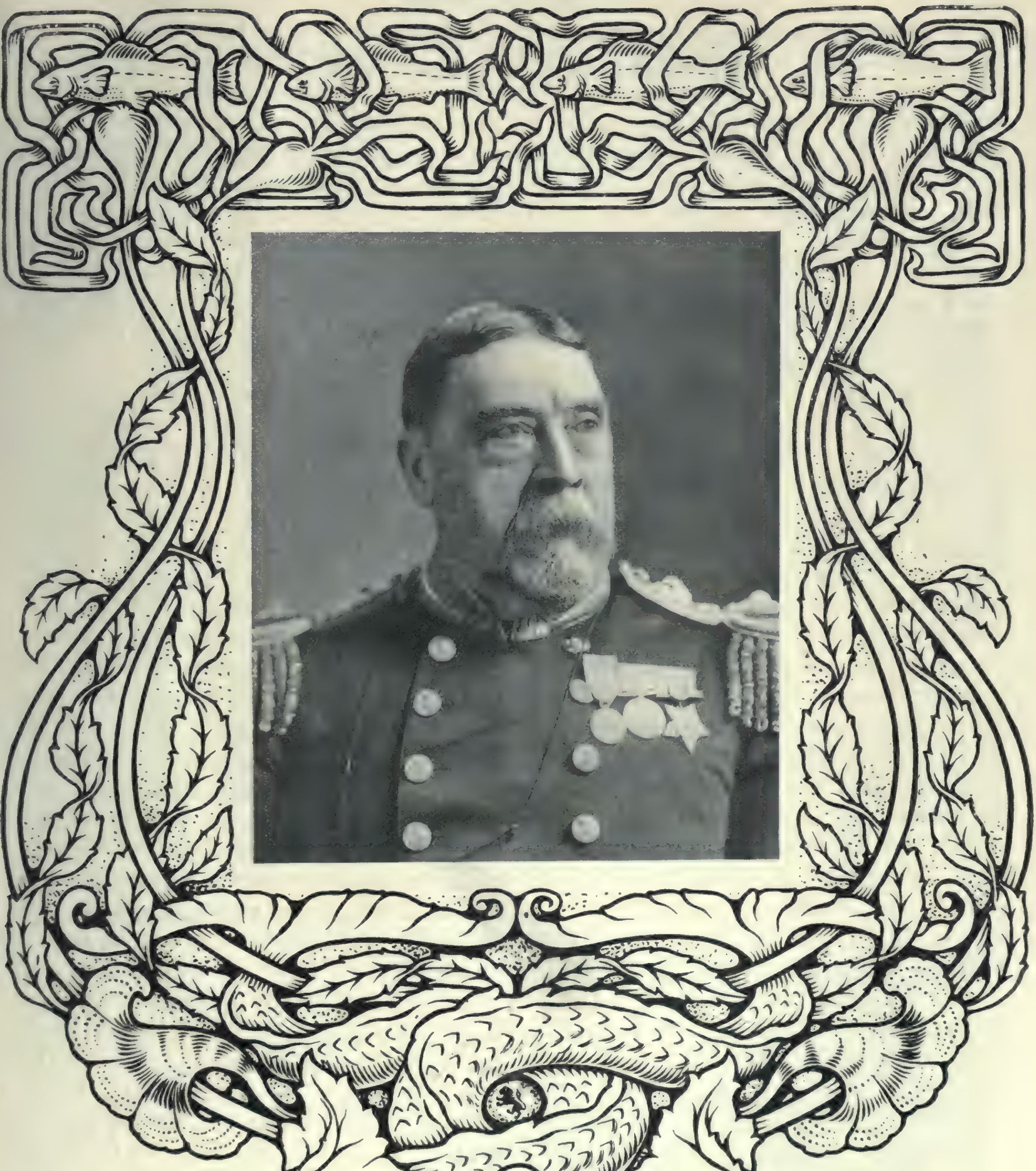
This prompt action on the part of the Admiralty has given universal satisfaction, and the gravity of the situation will be perceived when it is remembered that no such order has been issued to British fleets since the despatch of the memorable telegram of the Kaiser to President Kruger. The three squadrons*—which, combined, are the greatest product of naval strength ever witnessed in any waters—and the unusual warlike preparations in evidence at time of writing, at Portsmouth and other naval dockyards, ought to convince the Russian authorities that the Government is in earnest and determined to avenge not only an outrageous wrong to British subjects, but also a gross insult to the British flag.

A portrait appears on the opposite page of Sir Archibald Douglas, who has just succeeded Admiral Fisher in the Portsmouth command. Vice-Admiral Sir Archibald Douglas has seen a good deal of service since he joined the Navy in 1856. He was born in Quebec in 1842 and hence there was a peculiar appropriateness in his holding the command of the North American and West Indian stations. He was educated at the Quebec High School and joined the flagship *Boscawen*, when he was fourteen years of age; was appointed lieutenant in 1861, became Commander in 1872, Captain in 1880, and Vice-Admiral in 1901. He saw service with the naval brigade up the Congo and in Gambia in the sixties, was director of the Japanese Imperial College, three years, 1873–74–75, has commanded the *Serapis*, *Excellent*, *Cambridge*, and *Edinburgh*, and was appointed Commander-in-Chief in the East Indies in 1898. He had previously served as Vice-President of the Ordnance Committee and as a lord of the Admiralty from 1899 to 1902. He holds the Jubilee Medal, having acted as A.D.C. to the late Queen in the nineties.

---

* THE MEDITERRANEAN SQUADRON. Admiral Sir Compton E. Domville, in supreme command; consists of twelve first-class battleships, all of new types: *Albemarle, Bulwark, Cornwallis, Duncan, Formidable, Implacable, Irresistible, London, Montagu, Prince of Wales, Queen and Venerable.* Four Armoured Cruisers: *Aboukir, Bacchante, Lancaster and Suffolk.* Six Protected Cruisers: *Furious, Leander, Pandora, Pioneer, Pyramus, Venus.* Three Torpedo Gunboats and twenty-seven Torpedo-boat Destroyers.

THE HOME FLEET. Vice-Admiral Sir Arthur K. Wilson, V.C., in supreme command; consists of, Eight battleships: *Empress of India, Exmouth, Revenge, Royal Oak, Royal Sovereign, Russell, Swiftsure, Triumph.* Two Armoured Cruisers: *Bedford and Essex.* Two Protected Cruisers; *Dido and Juno.* Twenty-four Torpedo-boat Destroyers and a number of gunboats, which are not present, however, cruising with Admiral Wilson.



VICE-ADMIRAL SIR ARCHIBALD DOUGLAS.
Who has just succeeded Admiral Fisher to the Portsmouth command.

Rear-Admiral Jewell and the officers and men of the flagship *Olympia* will, it is to be hoped, carry away with them many pleasant recollections of London when the anchor is weighed at the end of the present month and the ship proceeds to Gibraltar. The most notable feature of the welcome extended to our American naval visitors was the graceful compliment paid to the American navy and nation by his Majesty the King, who invited Rear-Admiral Jewell and a small party of officers from the flagship to lunch at Buckingham Palace. The United States Ambassador, with members of his staff, and a number of British naval and military officers, were also present. Rear-Admiral Jewell occupied the post of honour on the King's right, and His Majesty proposed the health of the President of the United States with his customary urbanity and tact.

Next we hear of Rear-Admiral Jewell and his officers being entertained at luncheon by the Fishmongers' Company, and on Tuesday a dinner was given in his honour by the "Pilgrims," at the Savoy Hotel, the function being attended by a large and representative company of English and Americans. Lord Selborne proposed the toast of "Our Guests" in a happily worded speech, which opened with the few remarks on the North Sea outrage. As to the American sailors, he said he would never be tired of seeing or welcoming them, *because* they understood each other, and the admiration which Americans had so often expressed for the British Navy was wholly and entirely reciprocated.

The views of the flagship *Olympia*, appearing in this issue, were secured at Gravesend by one of our representatives, who received every courtesy at the hands of Admiral Jewell and his officers. Like many another able man, Rear-Admiral Jewell thinks more about his work than mere externals. At any rate, that is the deduction I draw from the difficulty experienced in obtaining his photograph for reproduction. London was ransacked in vain for a picture, and even a personal application to the Admiral failed at first to produce the desired photo. After considerable search the excellent illustration reproduced on page 473, was, however, unearthed, and I am glad to be able to introduce my readers to one of the most popular American officers of the day.

Lord Middleton, President of the Royal Agricultural Society, has issued an appeal to the members and friends of the Society, in which he states that the Council are all impressed with the necessity of carefully husbanding the Society's resources, and of the curtailment of expenses, whatever may be the decision as to future shows. In fact, they have already decided upon some substantial economies.

Before any engagements as to shows beyond 1905 are entered into, the members will be asked to express their opinion on the subject of the location and scope of such shows, and on the directions in which the various departments of the society's public work hitherto carried on can, in the future, be most usefully pressed for "the general advancement of English agriculture" which the society was established to promote.

But meanwhile, the question is urgent, whether there is or is not to be a show in 1905; and unless the members generally come forward to help the society, it is obvious that it cannot be held, as the society has now no reserve fund out of which it could take (as in former years) the amount by which the show receipts may fall short of the outlay necessarily entailed by the preparations for and the holding of the show.

The Council will meet on November 2nd, to consider the replies made to their appeal.

NEWS OF THE WEEK.

St. Louis Exposition Award.

I must congratulate Messrs. Davidson and Co., Ltd., of the Sirocco Engineering Works, Belfast, on having secured the Grand Prix and gold medal for the excellence of their exhibit of "Sirocco" fans. The jurors of the exposition considered the display of such exceptional merit as to classify their productions in the Machinery Hall under the head of an "educational exhibit." This distinction carried with it half the ordinary exhibition charges in consequence of fans having been manufactured outside the States. This abatement coming quite unexpectedly, in addition to the highest award, was of course very gratifying to the Belfast firm.

The Dee Railway Embankment.

The condition of the London and North-Western Railway's Embankment at Holywell has for some time past been a source of grave apprehension owing to a succession of high tides which have gradually increased the danger to which the line is exposed. The company are alive to the fact that immediate and elaborate steps must be taken in order to effect complete security, and to this end they are now spending about £2,000 per week in labour and material. In addition to the operations in progress on the outer bank, deep borings are being made in order to ascertain whether there are any moving sands, the presence of which has to be taken into account when designing the scheme of protection.

The Trans-Siberian Railway.

A proposal has been brought forward by Count A. F. Lubienski, a Russian engineer, for the electrification of the Trans-Siberian Railway. He considers that the utilisation of electricity will enhance the commercial and military value of the line. The numerous waterfalls in the vicinity of the line might, he thinks, be employed to supply the required power. It is reported that the Russian Government is in favour of the proposal, and is prepared to finance the scheme if the contractors will guarantee to complete the undertaking within a specified time.

Why all this hurry? I wonder. Whether the Government would be prepared to give its support to a line of flying machines between St. Petersburg and Port Arthur is not recorded, but, under existing conditions, I am inclined to put forward the idea for what it is worth.

Railway Construction in Peru.

A consular report from Peru states that the construction of the following railways has been authorised by Congress: From Oroya to Janja and Hunacayo; from Sicuani to Cuzco; from a section of the line between Oroya and Cerro de Pasco to a navigable point on the Ucayali or on one of its affluents. For the construction of these new lines of communication, or as a guarantee for the interest on the capital invested in the scheme, the under-mentioned sums are to be set aside yearly out of the public income. In the present year, £100,000; in 1905, £150,000; and in 1906 and the following years £200,000. The work is to be carried out by contract, but in the event of this proving impracticable, the Government will undertake the work on their own account.

Forthcoming Exhibitions.

Under the auspices of the Associated Chambers of Commerce, the London Chamber, and the Anglo-Belgian Chamber of Commerce in London, a committee has been appointed to organise a section representative of Britain in connection with the forthcoming Liége International Exhibition. In order that this country

THE RUSSIAN BALTIC FLEET. THE FLAG-SHIP LEADING.

The *Kniaz Suvaroff*, flag-ship of Admiral Rozhdestvenski, with the *Sissoi Veliky* and *Oslabia*.

THE RUSSIAN BALTIC SQUADRON. THE FLEET IN THE ROADS.
Showing the *Borodino*, *Aurora*, *Navarin*, *Oslabia*, *Dmitri Donskoi*, and *Sissoi Veliky*.

may be fittingly represented the committee invite subscriptions to enable them to complete the arrangements with the exhibition authorities; for this purpose it is estimated that a sum of £5,000 upwards will be required. As the exhibition opens early next spring, and in view of the fact that France, Germany, and the United States have already reserved large spaces, the question of British participation is one, I think, which calls for immediate decision. A prominent feature of the exposition will be a section devoted to mechanical instruments and machinery in motion. The exhibition will be open for six months, during which time a series of important conferences will be held.

Another exhibition to which I should like to call attention is that devoted to the Automobile industry, which will be held in Berlin from February 4th to February 19th, 1905, under the auspices of the German Automobile Club and the Association of German Motor-car Manufacturers. Applications for space, etc., should be addressed to "Baron von Brandenstein, 4a, Sommer Strasse, Berlin, N.W.

Personal.

Professor L. F. Vernon-Harcourt, M.A., professor of civil engineering and surveying at the University College, London, has received His Majesty's permission to accept and wear the Comthur Cross of the Imperial Order of Franz Josef, which was conferred upon him by the Emperor of Austria in recognition of valuable services.

Rear-Admiral George W. Melville, formerly engineer-in-chief of the American Navy, has opened offices in Walnut Street, Philadelphia, as a consulting engineer and naval architect.

Mr. Wylie, of Brasenose, who was at one time tutor to Lord Rosebery's sons, has under his immediate care the Rhodes scholars who have entered upon their residence in Oxford.

The Palace of Peace.

At last, the long-standing difficulty with reference to the erection of Mr. Carnegie's Palace of Peace, is solved. The Government of Brussels has decided upon purchasirng a plot of land near the Hague, and the work of construction will be commenced immediately.

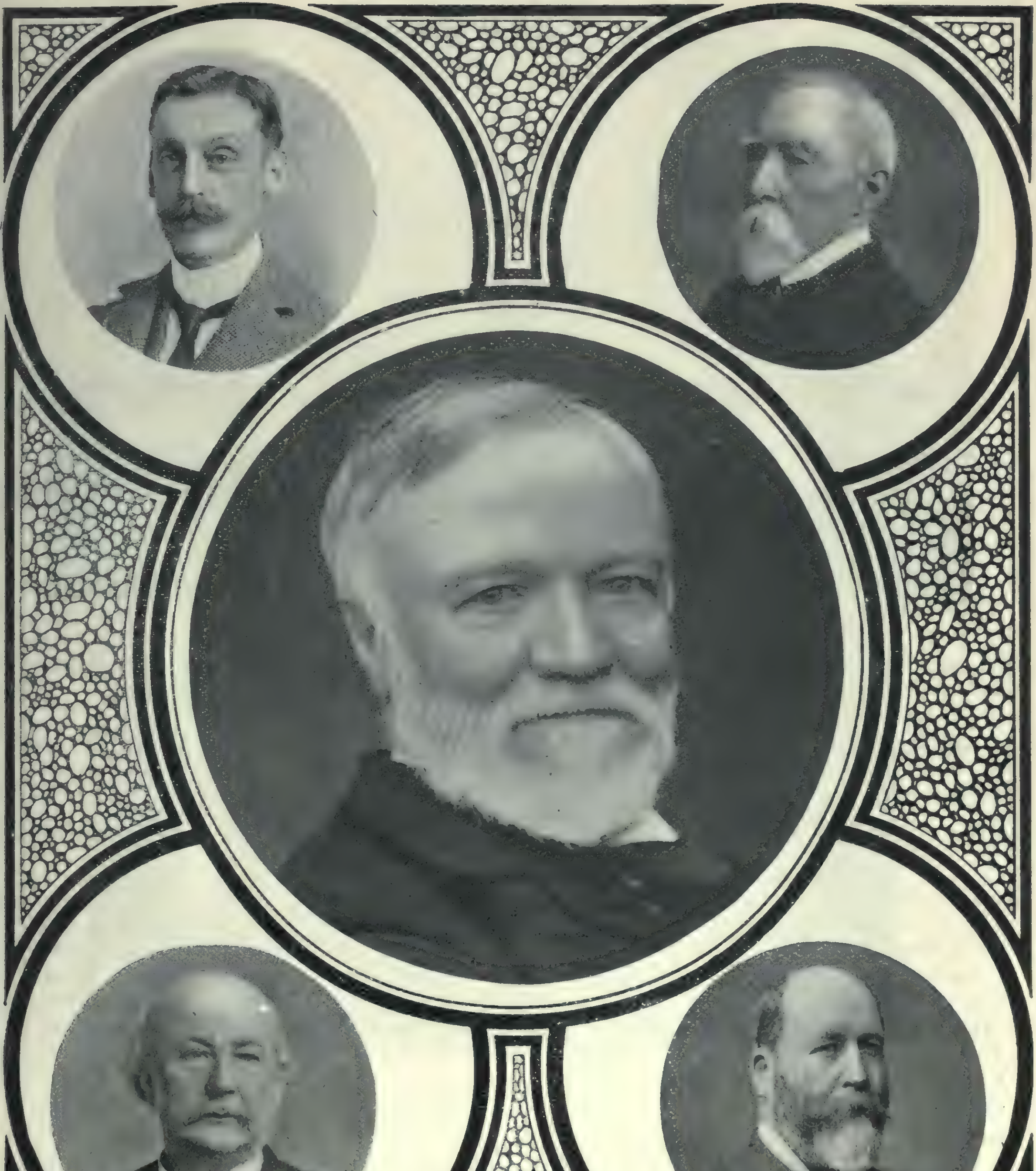
Institution of Civil Engineers.

About seventy-five members of the Institution of Civil Engineers attended the international engineering congress held in St. Louis. They had previously inspected the plant of the Illinois Steel Company and other places of engineering interest in Chicago.

Notable Contracts.

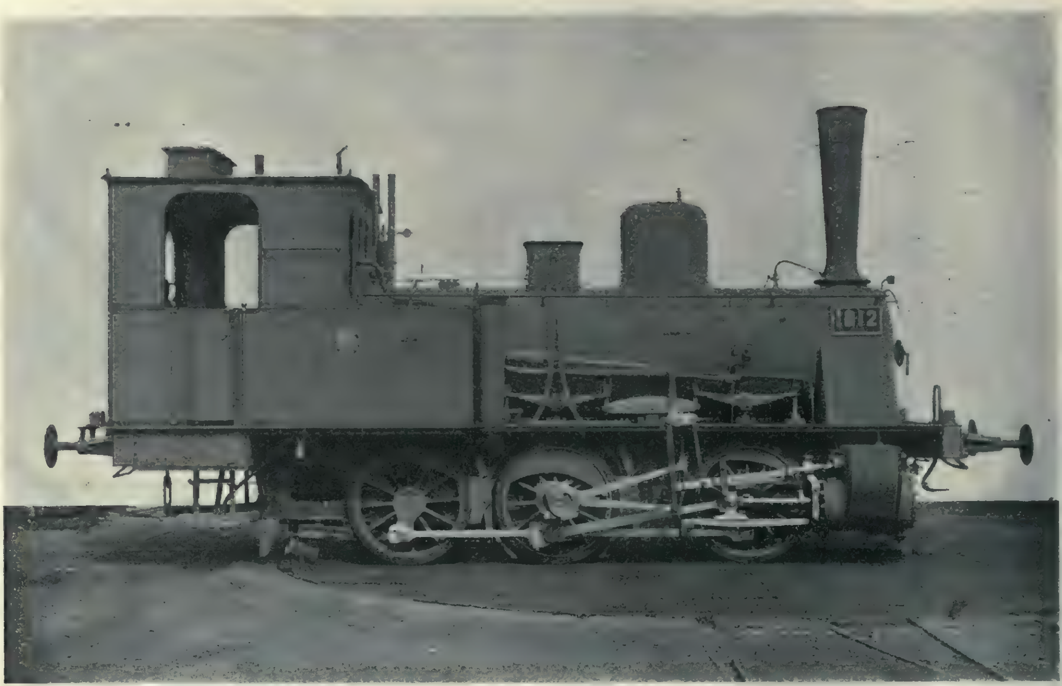
Messrs. Mather and Platt, Ltd., have just completed a notable contract. About a year ago they were successful in obtaining the contract for the generating plant and station equipment of the new electricity works at Harrismith. The plant comprised an overhead travelling crane, two Morrim Climax water-tube boilers, with fuel heaters, and pumps, and two steel chimneys, two 80 kilowatt single-phase alternators, with a frequency of 50 cycles per second, and a full load pressure of 2,100 volts, with direct coupled exciters, and driven directly by two Howden enclosed compound engines, one 25 kilowatt set of similar design, two complete condensing plants, with motor, driven centrifugal pumps, switchboard, and all cable connections and pipe work. The contract specified particularly that time was an essential consideration, and Messrs. Mather and Platt, Ltd., undertook to have the whole of the plant erected and at work within three months of the first consignment reaching Harrismith. This undertaking they have successfully carried out; as the first goods reached the works at Harrismith on June 14th, and on September 12th their engineer was able to despatch a cablegram stating that all three sets of alternators were running on the town supply mains.

Another contract which tends to demonstrate the fact that British engineers fully realise the necessity of expeditious execution is the one which Messrs. Graham, Morton, and Co., Ltd., have in hand for the supply and erection of a large complete coal-screening plant for the Wheldale Colliery Company, of Castle-



THE IRON AND STEEL INSTITUTE MEETING OPENED THIS WEEK AT NEW YORK.—SOME LEADING MEMBERS.

In the centre is Mr. Andrew Carnegie (President). Above are photos of Mr. R. A. Hadfield, M.Inst.C.E., M.I.Mech.E., and Sir E. H. Carbutt, Bart., J.P., D.L., M.Inst.C.E., M.I.Mech.E., to the left and right respectively. The lower photos are those of Mr. E. Windsor Richards, M.Inst.C.E., M.I.Mech.E. (left), and Mr. E. P. Martin, M.Inst.C.E., M.I.Mech.E. (right).



The above illustration shows a Six-coupled Locomotive for the Prussian State Railways, intended for use on branch lines. It was built by the Hunboldt Engineering Works Company, Kalk near Cologne. The principal dimensions are :—

Diameter of cylinder	13¾ in.	Total heating surface	646 sq. ft.
Stroke	21¾ in.	Grate area	14½ sq. ft.
Wheel diameter	3 ft. 7¼ in.	Tank capacity	141 cubic ft.
Wheel base	9 ft. 10 in.	Coal capacity	1 ton.
Steam pressure	180 lbs.	Weight (empty)	24½ tons.

Weight loaded for service ... ... 32 tons.

A large number of these engines have been built and have proved satisfactiory in regard both to economy and efficiency.

ford. This contract, which was considerably extended a day or two ago, will be carried throughout without the slightest interruption to the work of the colliery.

Messrs. Kerr, Stuart, and Co., Ltd., of London, and Stoke-on-Trent, who are building three motor coaches for the Buenos Ayres Great Southern Railway (5 ft. 6 in. gauge) have just received an order from the Taff Vale Railway Company for six motor coaches to be built on the well-known Taff-Vale system.

De Forest Wireless Telegraphy.

There was an interesting function on Tuesday evening when Dr. Lee De Forest was the principal guest at a dinner at the Hotel Cecil given by Mr. Franck L. Maguire, the vice-president of the American De Forest Wireless Telegraph Company. Sir Wm. Preece, who presided, paid a high tribute to the work of Dr. Lee de Forest, which, he said, had been fully acknowledged in an article appearing in the Times.

Dr. Lee De Forest, in responding, referred to the good work done by Captain Lionel James, when the war service was initiated in the China seas. It had established absolutely new records. From a boat equipped with only 96 ft. of wire, and one kilowatt transmitter, messages up to 1,700 words in length were transmitted over distances up to 210 sea miles at a speed of 25 to 35 words a minute, and frequently in face of transmission from any number of Japanese, Russian, German, and British vessels.

Discussing the relative cost of wireless and land wire, Dr. Lee De Forest said that the Western Union had estimated the cost of the construction of a single wire at £60 to £80 per mile, which would mean that a wire from St. Louis to Chicago would call for an expenditure of £18,000. The cost of the wireless stations over the same distance would be but £3,000.

REAR ADMIRAL JEWELL, OF THE UNITED STATES NAVY.

(Details of whose cordial welcome to London this week will be found on page 468. Views of the United States Flagship "Olympia" appear on pages 480 485.)

The principal features of the "Olympia" are as follows :—

Engines : 2 sets vertic. inverted cylind. 3 expans. Boilers, 6, two single-ended, four double-ended. Furnaces, 40. Protection : steel deck, 2 to 4·7 in. Barbettes and hoods, 3½ and 4½ in. Ammunition tubes, 3 in. Two con. towers, 5 in. 5-in. gun shields, 4 in. Cellulose belt, 33 in thick and 8 ft. 5 in. broad. Coal protection. Armament : 4—8 in. B.; 10—5 in. Q.; 14—6 pr. Q.; 7—1 pr. Q.; 1 Gatling mach. Compt. 486.

QUESTIONS OF THE DAY.

II.—The National Encouragement of the British Inventor: How Can it be Secured ?

IN throwing open our columns to a discussion of this national question, we have given precedence to a letter addressed to the Editor by Mr. B. H. Thwaite, C.E., F.C.S. This will be followed next week by a quantity of interesting correspondence from other inventors and patent experts. Mr. Thwaite is well entitled to initiate this discussion, for he has probably taken out as many patents in proportion to his age as any living Englishman. He is the author of "The Cultivation of the Inventive Faculty," and of the prize essay (Society of Engineers) on "The British and American Patent Laws Compared."

29, Great George-street,
London, S.W.
Wednesday, Oct. 26th, 1904.

To the Editor of PAGE'S WEEKLY.

SIR,—All unprejudiced observers are agreed that the manufacturing industrial condition of this country is unhealthy—indeed, in comparison with the robust character of the American manufacturing industry, it may be said to be dangerously so. Experts differ in the results of their diagnosis to explain the causes of this unhealthiness, but there is, nevertheless, a fairly unanimous opinion, in which it is admitted that the American inventive faculty is far more effectively cultivated and encouraged than is that of the Britisher. Hence the urgency of the subject.

AMERICAN STATE POLICY RELATING TO THE INVENTOR.

It has always been an axiom of the American constitutional system from the time of its practical inception, which axiom, expressed in the words of the illustrious George Washington, states, "that it is nationally expedient to give effectual encouragement to the exertions of native skill in producing new and useful inventions." That this wise axiom has been faithfully recognised by all the various Administrations controlling the American national policy, is well known to all those who have diligently examined the financial and other statistics of the American Patent Bureau. For instance, no attempt has been made to secure any considerable, or even any, profit from the American State protection of the inventor, as long as the Patent Department was run at a bare profit the Government has ever been satisfied.

THE WONDERFUL SUCCESS OF THE AMERICAN POLICY.

The American policy has proved magnificently successful. The fertility and resource of the American inventor is most remarkable: in nearly every branch of human activity the products of the American inventive genius can be found. In armour plating, artillery, merchant steel and iron production, transit arrangements, production of new and old industrial products, the harnessing of the electrical agency to the use and for the convenience of man, the application of mechanical science to the agricultural industry, the production of automatic machinery to industrial and domestic services—in all these and hundreds of other practical developments involving the initiation of ingenious and valuable innovations on established procedure, both social, civil, military and industrial, we find the practical effect of the American State encouragement of the inventor.

How different is the American munificent policy relating to the inventor compared with that adopted by successive British Governments.

FISCAL POLICY RESPONSIBLE FOR SERIOUS TAXATION PROPORTIONS.

The Chancellor of the British Exchequer in allowing the free importation of foreign manufactured goods, is compelled to search for other sources of revenue, and one of these sources has been the British Patent Department. If proof is required here it is: In the period 1890–1899 the British Government secured from the Patent Department over one million pounds sterling, whereas, in the same period and for about twice the number of patent applications, the American Patent Department earned a revenue over expenditure only equal to a little over a quarter of a million pounds sterling. But whilst the American Government grants the inventor a full seventeen years in which to exploit and commercially perfect his invention—which, if of great importance, may occupy a period of years, often from eight to ten—for a modest payment in two instalments, the British inventor, often poor in wealth, if rich in inventive resource, is taxed in increasing progression, and in yearly increments.

£99 TO BE PAID BY THE BRITISH INVENTOR EXCLUDING INTEREST.

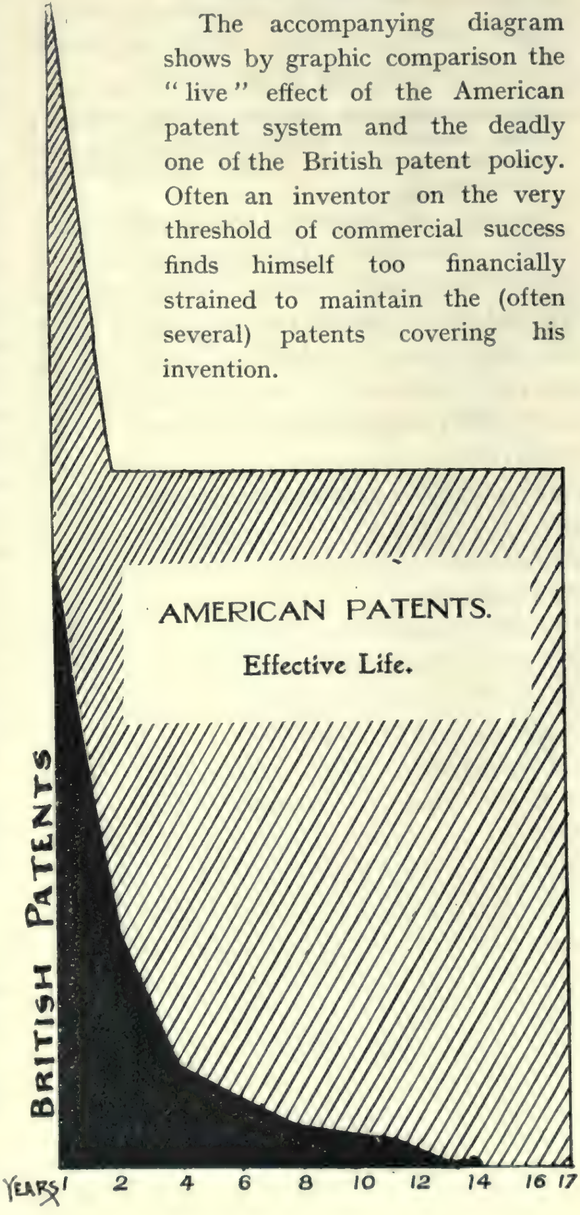
Until, at the end of fourteen years, the term of the British patent, he will have paid the Government no less than £99, whereas the seventeen years of the American patent was secured by the payment by the end of the second year of £7 5s. 10d.

DIFFICULTY IN SECURING COMMERCIAL PERFECTION.

The difficulties the average British inventor finds in securing the commercial perfection and success for his invention are alone almost insuperable, without the deterrent effect of the yearly taxation, which is only too successful in discouraging the inventor. By the end of the eighth year from the date of the application, only about one in every fourteen applications for British patents is alive, and only one in seven of the patents actually sealed is renewed; by the end of the twelfth year only one in fourteen of the original sealed patents is in force—the cruel yearly taxation has done its work only too well.

THE GRAPHIC COMPARISON BETWEEN THE EFFECTS OF THE AMERICAN AND BRITISH PATENT SYSTEMS.

The accompanying diagram shows by graphic comparison the "live" effect of the American patent system and the deadly one of the British patent policy. Often an inventor on the very threshold of commercial success finds himself too financially strained to maintain the (often several) patents covering his invention.



THE EFFECT OF THE RENEWAL TAX PRINCIPLE

His American brother inventor can smile, because if a term of eight or nine years has been absorbed in commercially perfecting the invention, he has still eight or nine years to secure his well merited recompense. Inventions are very often created "too previous" to be commercially acceptable, and the discouragement given to the inventor, plus the annual taxation, compels him to abandon his inventive offspring to the world's indifference, and, like an outcast, it may become a danger instead of proving a benefit and blessing to the State.

PATENTS ABANDONED, BECAUSE OF THE RENEWAL FEES, CONSTITUTE ANTICIPATIONS TO FUTURE INVENTORS, TO THE GREAT DETRIMENT OF THE STATE.

Because the invention, abandoned though it is, *has been published*, and it constitutes at once an *anticipation*, and by the *effect* of the *new Patent Act* shortly to come into force, it may either *prevent* a subsequent inventor from *securing a patent* at all, or, as an alternative, the Patent Office will insist on *printing* a *published reference* in the specification as an anticipation *that may often*, from a capitalist point of view, *be as fatal* to the commercial success of the invention as would be a complete abandonment. In the last twenty-five years probably a hundred thousand inventions have been made abortive as instruments of public service by the effect of the renewal fee taxation—now, all these *abandoned*, but *published*, patents for invention will constitute in some measure anticipations to future inventions, thousands of them, and many of them very valuable improvements, would, had they been patented in America, have been eventually developed for the good of the United States and its millions of inhabitants—but here in England they *only add* to the *published list* of *tax-killed inventions*, to act as a barrier to future inventive effort.

Unfortunately, for many future inventors, this last twenty-five years may be said to constitute the time basis of the electrical era, because the development of the applications of the electrical science promises to constitute the distinguishing feature of the twentieth century, so that the anticipations provided by the thousands of tax-killed inventions will probably prove to be more deadly in that particular branch of industry—which is to be supreme in inventive activity—for the next ten decades, than in any other branch of applied science.

THE FOREIGN INVENTOR CAN PAY THE BRITISH RENEWAL TAXES FROM PROFITS DERIVED ELSEWHERE.

But if the British inventor has actually been crushed by his taxing master, his American contemporary has been able not only to secure commercial success, *but from this success in his own country* he has been able to secure and maintain a British patent or patents, which he arranges to have *manufactured in the United States*, to be *imported*, *untaxed*, into this country, the competition of which he can *restrict*, if not *prevent*, by his *British patent*. This principle has also been adopted by German patentees, who have the double advantage of securing free entry for their patented manufactures into this country, as well as the right through their British patents of interfering, if not preventing, by threatened legislation, the manufacture of the patented article in this country, because the British Patent Law does not enforce the commercial working of the patent—did it do so, with the patent renewal-fee system maintained, very few patents would be carried beyond the fifth year.

PATENT LAW SHOULD INSIST ON PROOF OF BONA FIDE ATTEMPT TO SECURE COMMERCIAL WORKING.

That an inventor should be compelled to prove, by affidavit when challenged, that he has done the utmost that lies in his power to secure the commercial working of his invention is desirable and should be made compulsory. A clause to secure commercial working, if added to the new Patent Act would prevent foreign patentees from taking unfair advantage of the British manufacturer.

WHAT SHOULD BE DONE TO SAFEGUARD BRITISH INVENTORS AND MANUFACTURERS?

The question, and one that should concern the engineers and manufacturers of this country is, what course should be adopted to safeguard and stimulate the inventive faculty of the British race? The essential object to be secured is to prevent the evils of the present system from being allowed to interfere with the progress of future invention. That this object will only be attained with great difficulty is admitted; but it must and can be done. Let the new Act be modified, or extended, to permit the inventor to secure, by payment of a nominal sum, the revivication of a commercially unworked patent for the term of the unexpired years.

A PROPOSAL TO SECURE (1st) THE REVIVICATION OF ABANDONED PATENTS, AND (2nd) THEIR USEFULNESS TO THE STATE.

Dating from the period when the patent lapsed through the non-payment of the renewal fee, to the end of the fourteen years—for instance, if an inventor failed to pay the eight years' tax, he should be allowed the option of reviving an unworked patent for a period of six or a longer term of years. The inventor of a process partly anticipated by a patent, abandoned because of inability of the patentee to pay the renewal fees, could assist the latter to secure such revivication to the great advantage of both parties. The effect of this policy would be to provide a desirable stimulus to inventive activity, it would undoubtedly reduce the deadly effect of the abandoned patents from destroying the usefulness of the new Act.

THE REDUCTION OF BRITISH PATENT TAXATION CHARGES TO THE AMERICAN LEVEL.

The policy of the American Government in giving the inventor a seventeen years patent for some £7 odd should be adopted, retaining the provisional protection principle, a redeeming feature of the existing British Act.

THE TERM OF THE PATENT SHOULD VARY IN PROPORTION TO ITS IMPORTANCE AND THE COST OF COMMERCIAL PERFECTION.

The term of the British patent life should be *varied in proportion to the magnitude of the work, the expense incurred, and the time occupied in commercially perfecting* and introducing the patent into public service, but seven years should be the maximum limit allowed to attain commercial perfection, and twenty-one years should be the maximum patent life period allowed, and measured from the date of application, *to enable the inventor to secure for himself and his co-operators an adequate return for the risk he has taken in securing the commercial perfection of the invention.*

Yours faithfully,

B. H. THWAITE.

LETTERS TO THE EDITOR.

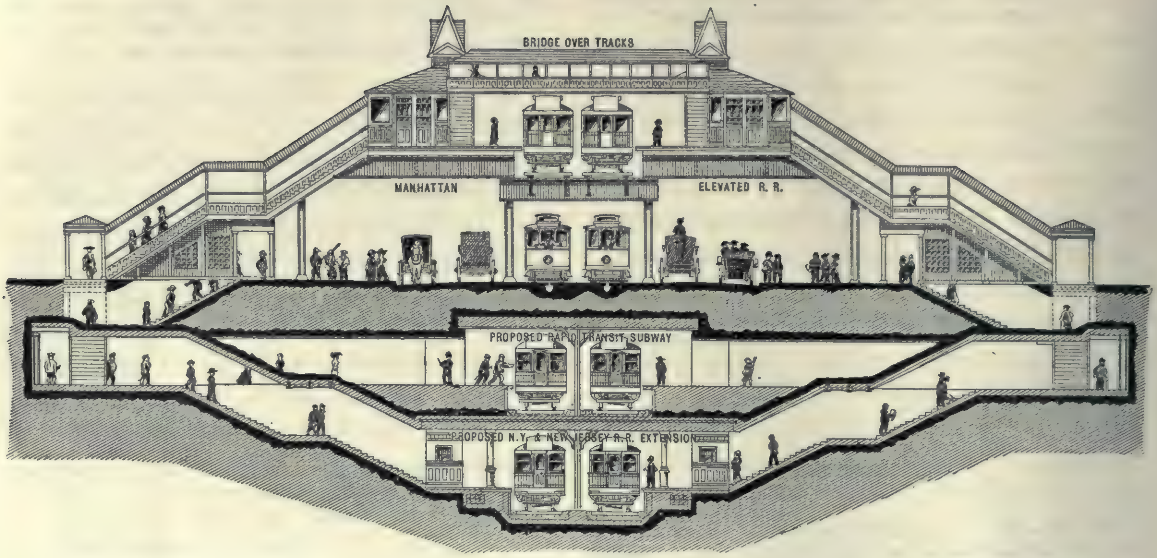
The London Telephone Service.

To the Editor of PAGE'S WEEKLY.

SIR,—We are not at all satisfied with the London Telephone Service as it is at present, and it is a constant source of annoyance to us. Not knowing the inner workings of the telephone system it is a difficult matter for us to say in what direction it could be improved, but we think it is perfectly evident that human operators should be abolished altogether and an automatic substituted. It appears to us the only excuse a telephone company can make is the fallibility of human nature; to our minds this could be rectified by an automatic exchange.

Inattention to calls, and the constant interruptions during conversation, and cutting out without any warning is our chief source of annoyance, and we are confident this could be abolished by a proper discipline, at any rate.—Yours faithfully,

ARMSTRONG AND CO.


BRIDGE OVER TRACKS
MANHATTAN
ELEVATED R. R.
PROPOSED RAPID TRANSIT SUBWAY
PROPOSED N.Y. & NEW JERSEY R.R. EXTENSION

CROSS SECTION OF PROPOSED TRACKS IN NEW YORK, SHOWING FIVE LEVELS OF TRANSPORTATION.

ENGINEERING DEVELOPMENTS OF THE WEEK.

ILLUSTRATED.

Proposed Five Levels of Transportation in New York.

The accompanying diagram, for which I am indebted to Machinery, shows in a vertical section the four levels of railway lines proposed at the intersection of Sixth Avenue. with Broadway at Thirty-Third-street, and a fifth level above all in the shape of a foot-bridge over the Thirty-third Street Station. This is, of course, an extreme condition even for New York but it gives some idea of the great traffic at this point and future plans for handling it.

Petrol Launches on the Thames.

At their weekly meeting, the Thames Conservancy Board referred to a committee the expediency of making special regulations for the licensing of petrol launches. It was stated that the number of such launches on the river had increased from 46 in 1900 to 273 at the present time.

The Port of London.

An exhaustive report by the Rivers Committee of the L.C.C. recommends the Council to promote a Bill in the session of 1905 providing for the establishment of a Port of London Commission of 40 members, of whom 24 are to be appointed by the Council, four by the City Corporation and Government departments the remaining twelve to be trade and shipping representatives. Provision is to be made for the transfer to the commission, with certain modifications of the rights, powers, duties, and liabilities of the Conservators of the River Thames below Teddington Lock, of the Watermen's Company and Court of Watermen's Company, in respect of the registration and the licensing and control of lightermen and watermen, and of the undertakings, liabilities, and obligations of the London and India, Surrey Commercial, and Millwall Dock Companies.

The Bill will define the Port of London as extending, with certain exceptions, from an imaginary straight line between Teddington and Twickenham and an imaginary straight line between Havengore-creek, Essex, and Warden Point, in the Isle of Sheppey, Kent, the Board of Trade to be empowered to extend by provisional order for the special purposes of dredging the powers of the Port Commission eastward of the present limit of the Thames Conservancy.

It will provide for the contribution by the Council of a sum not exceeding £2,500,000 towards the expense of improving the channels of the port, the sum to be contributed annually not to exceed £250,000, and the plans and works of improvement to be subject to the approval of the Council.

The consideration for the purchase of the undertakings of the three dock companies by the Port Commission is to take the form of port stock to such an amount as may be agreed upon between the Commission and each Company, or, in default of agreement, may be determined by a special Court of arbitration consisting of three arbitrators, who should be required to state in any award both the money value of the undertakings and the amount of stock which they have awarded as the equivalent of such money value.

Progress in Rhodesia

The ninth annual report of the Rhodesia Chamber of Mines shows that during the year ended March 31st, 1904, about 137,000 ft. of development work was accomplished in Southern Rhodesia at an average cost of £5 per foot, and nearly 4,000 ft. of main shaft sinking was carried out at £7 per foot. The cost of this represents an expenditure of £713,000. The greatest depth attained appears to be that of the Globe and Phœnix and Selukwe mine, where the main shaft is returned at 939 ft., and the lowest level at 916 ft. Returns from seventeen of the principal mines gave an average depth of the main shaft of 442 ft. and of lowest level 417 ft., while the extent of work on the lowest levels of those mines is 5,975 ft Of the 12,261 claims owned by these mines 500 only have been prospected or developed, and 169 have been stoped from. Only 1,705 ft. of diamond drilling was carried out during the year.

The Steamers for the Thames Municipal Steamboat Service.

A very interesting report has been issued by the Rivers Committee of the London County Council on the subject of the thirty new steamers to be provided for the Thames steamboat service. The firms tendering were at first invited to tender for ten, twenty, or thirty boats.

Tenders were received from the following: Messrs. Armstrong, Whitworth and Co., Ltd., Newcastle-on-Tyne; Messrs. A. and J. Inglis, Glasgow; Messrs. Cammell, Laird and Co., Ltd., Birkenhead; Messrs. Napier and Miller, Ltd., Yoker, near Glasgow; Palmer's Shipbuilding and Iron Company, Ltd., Jarrow; John Reid and Co., Ltd., Whiteinch, Glasgow; Messrs. Russell and Co., Port Glasgow; John Stewart and Son, Ltd., Blackwall; Messrs. Swan, Hunter, and Wigham Richardson, Ltd., Wallsend; the Thames Ironworks, Shipbuilding, and Engineering Company, Ltd., Blackwall; and Messrs. J. I. Thornycroft and Co., Ltd., Chiswick.

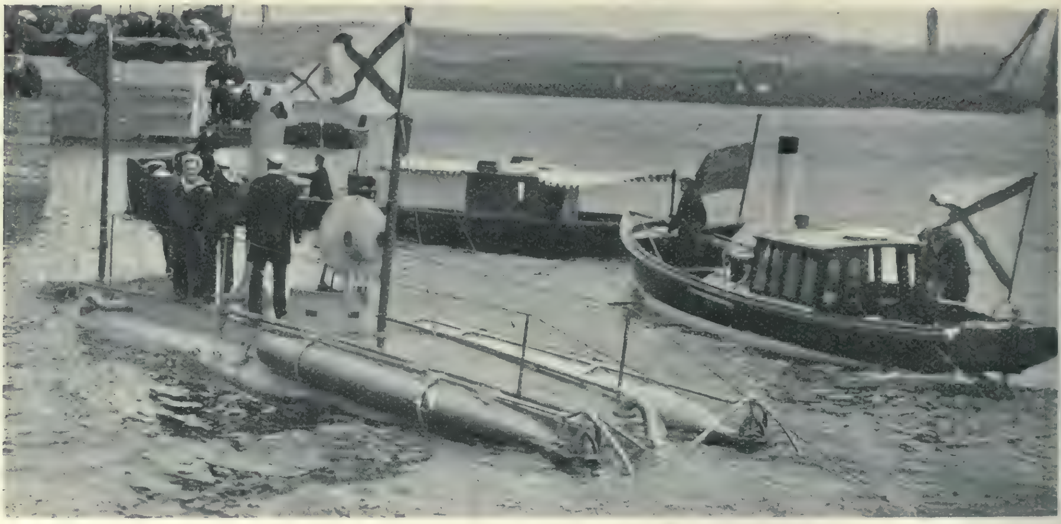
On consideration of the tenders and the accompanying designs and specifications, it was found that they were not in all respects comparable; and it was, therefore, thought desirable that each of the three provincial firms and the two London firms whose designs were considered most suitable should be invited to send in an alternative offer for boats built to a more definite specification, so that the revised tenders of these five firms might be compared on an exactly similar basis. The five firms in question were Messrs. Armstrong, Whitworth and Co., Palmer's Shipbuilding and Iron Company, Messrs. Napier and Miller, the Thames Ironworks, Shipbuilding and Engineering Company, and Messrs. J. I. Thornycroft and Co.

Each of these firms tendered for ten steamers and the following were the amounts of the tenders for one steamer: Messrs. Thornycroft and Co., £5,950; Messrs. Napier and Miller, £5,950; Palmer's Shipbuilding Company, £6,397; Messrs. Armstrong, Whitworth and Co., £6,400; and the Thames Ironworks Company, £6,500. The Council's engineer has carefully examined all the designs and specifications, and after full consideration in conjunction with the naval architects whom they have consulted on the subject, the committee have decided to recommend the Council to accept the tenders of Messrs. Thornycroft and Co., Messrs. Napier, Miller and Co., and the Thames Ironworks Company for ten steamers each at the prices stated in their tenders. The length of the boats is to be 130 ft., the breadth 18 ft., the deadweight carried at 2 ft. 10 in., draught 25 tons, the approximate number of passengers 320, and the speed 13 miles.

Should the Council agree to these recommendations, work to the amount of £124,500 will go to London firms, while a contract for £59,500 will go to the Clyde. The contract price for the boats does not include the panelling and upholstering of the saloons, and an allowance has to be made for these, as also for spare parts and extras, which the engineer states will be required, and for contingencies. In these circumstances the committee ask the Council to pass a vote of £203,000 for the boats. The engineer's estimate for the boats submitted to Parliament was £210,000.

For the provision of new piers and moorings, and for providing and fitting up a repairing yard and grid, the sum of £71,956 will be required. It is proposed that a steam launch for the manager's use shall be provided at a cost of £4,500, and this will be added to the capital cost for boats.

The committee further recommend that Mr. A. R. Owen should be appointed manager of the steamboat service at a yearly salary of £500.



THE NEW RUSSIAN SUBMARINE BOAT, THE "PETR KOCHKA" (FROM PLANS BY ENGINEERS KOLBASIEFF AND KUTEINIKOFF).

It is believed that several submarines are accompanying the Baltic Fleet, and it is highly probable that the above—one of their newest boats—is one of them.

NAVAL NOTES.

WEEKLY NOTES ON NAVAL PROGRESS IN CONSTRUCTION AND ARMAMENT.

(BY OUR NAVAL CORRESPONDENT.)

GREAT BRITAIN.

THE past week has been notable in Naval circles for two reasons—the ninety-ninth anniversary of Trafalgar and the advent of the new First Sea Lord.

It is hoped that the *Dominion* battleship may be able to begin her trials during the present week. They will follow the ordinary course—thirty hours at one-fifth power, thirty hours at four-fifths power, and eight hours at full power, and stopping and starting engines, circle-turning and steering trials. All going well, the trials should be over in six days, and the vessel will then be prepared for delivery at Chatham, ready for commissioning early in the next financial year. The *King Edward VII.* is also to be ready for service by June next, when, it is stated, she will go to the Mediterranean as flagship of Rear-Admiral Prince Louis of Battenberg. So many changes in command in the Mediterranean have just been made, however, that this statement must be received with some reserve.

The somewhat involved case of the Austrian torpedo-boat contract has drawn attention to the question of shipbuilding on the Thames.* The decline of this industry on Thames-side, has been most marked during the past decade, and a large number of big firms have either moved to the North or have ceased business. And now an official of the Yarrow Co. in talking to a reporter has said "that four or five years ago the firm removed without trouble to their present premises, and it would entail little, if any, inconvenience to business to remove the headquarters to the North *if such a step were decided on.*" The words italicised are distinctly ominous, and on top of this comes a report which may or may not be well founded, that Messrs. Thornycroft contemplate leaving Chiswick. Should these two removals take place, the only warship builders on the Thames would be the Blackwall firm, the Thames Shipbuilding Co. The causes for these changes of domain during the past few years have been many and various. Not the least among them has been the necessity for paying a very high rate of wages, owing to the expenses and cost of living for the workers in the yard. This counteracts the comparatively low rate of transport for raw material from the Continent, and it is really not to be wondered at that so many firms have removed.

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* The circumstances attending the loss of this order will be found on page 386—No. 5, Oct. 14, 1904.—Ed.

The destroyer *Kennett* will be ready for delivery very shortly, and the *Jed* is completing her trials.

FRANCE.

We are continually being told that the cost of building warships in the British public yards is greater than in the private yards, but the difference in cost is not so startling as it is in France. Some very instructive articles on this subject have recently appeared in the French press, and from these it would appear that the average cost per ton of a battleship in England is £68, while in France it is £92. A very cogent example is given of the difference between the cost of construction in public and private yards. The *Carnot* of 12,000 tons was built at Toulon, and cost 28,000,000 frs. (£1,120,000), while the *Massena* of 12,300 tons, built at St. Nazaire, cost only 26,500,000 frs. (£1,060,000)—a difference of £60,000. And this for a vessel of 300 tons more displacement, and allowing for a profit on the building in order to pay a dividend to the shareholders. The difference between the cost of French-built and British-built ships is very clearly shown by the cases of the *Jurien de la Gravière* and the *Hermes.* The former commenced at Lorient in 1897, was commissioned for the first time in 1902; the latter, built by the Fairfield Company, was laid down at the beginning of 1897, and put into service two and a half years later. In many respects the vessels are similar, but the cost of the *Hermes* was £278,349, while the cost of the *Jurien de la Gravière,* exclusive of armament, was £400,201.

The *Victor Hugo,* which was laid down at Lorient on July 16th this year, is progressing rapidly; her belt of 116 plates is almost complete.

Forty-eight more torpedo-boats are to be put in hand, all but two of them being contracted for by the private companies at Nantes, Bordeaux, Havre and other places, the other two being built in the dockyards. France is also about to experiment with scouts of 1,600 tons displacement, 3,800 h.p., and 18 knots speed. These have been designed by M. Bertin for a radius of action of 7,300, and their armament is to consist of four small quick-firers and seven torpedo tubes, of which two will be submerged. It is not stated how many of these are to be laid down first, nor is information given as to the date of commencement.

GERMANY.

"The new German naval programme" has been so often announced by the Press, that one is inclined to be sceptical about each fresh report. And certainly the latest which comes from Berlin, *via* Washington, is far from credible. According to this, thirty-eight new battleships are projected, with a proportionate number of cruisers, "having the effect of adding to the German navy no less than seventy-six vessels of war." The Naval Secretary will, it is added, present the plans for financing the measure, and the shipbuilding yards of the country have reported themselves as willing and able to undertake the work.

ITALY.

The naval estimates for the year 1904-05 amount in all to 127,191,083 lire (£5,087,643), being £374 less

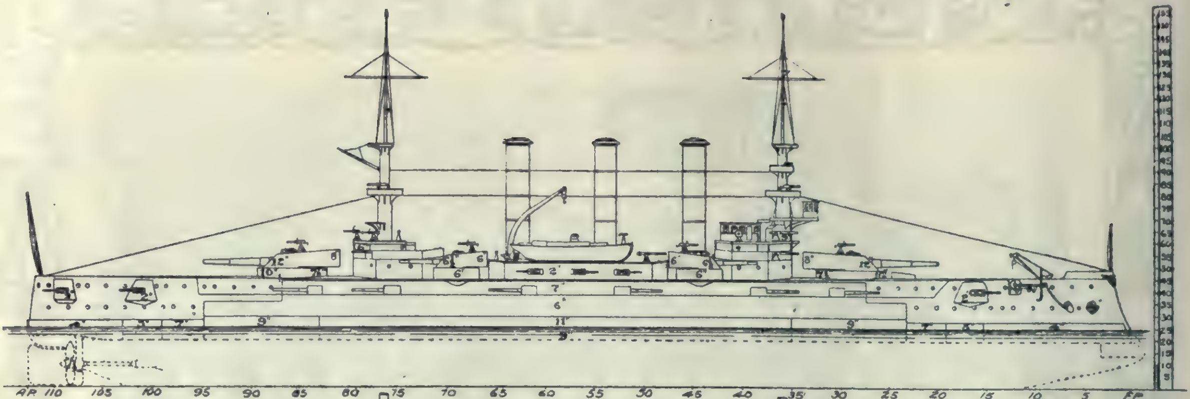
A VIEW ON BOARD THE U.S. FLAGSHIP "OLYMPIA" DURING HER STAY IN THE THAMES.

THE FRENCH BATTLESHIP "JAUREGUIBERRY."

Length, 364 ft.; beam, 72 ft. 6 in.; maximum draught, 29 ft.; displacement, 11,824 tons. Armament: Two 12 in. breachloaders in balanced turrets, one forward and the other aft. Two 10·8 in. breachloaders in turrets, one on each beam: eight 5·5 in. quick-firing guns in pairs in turrets, one on each quarter, and one on each bow; four 9-pounder quick-firing guns; eighteen 3-pounder quick-firing guns; eight 1-pounder maxims or revolving cannon; six torpedo tubes; two submerged.

OTHER VIEWS ON BOARD THE FLAGSHIP ' OLYMPIA."

(By our own representative.


OUTBOARD PROFILE.
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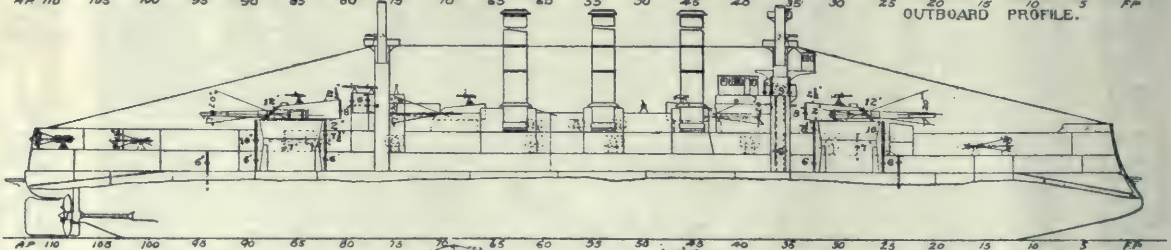

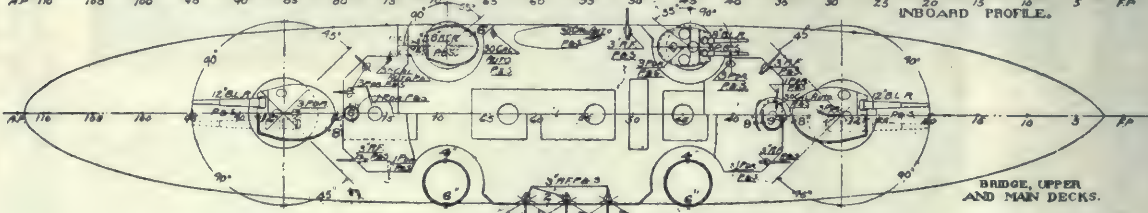

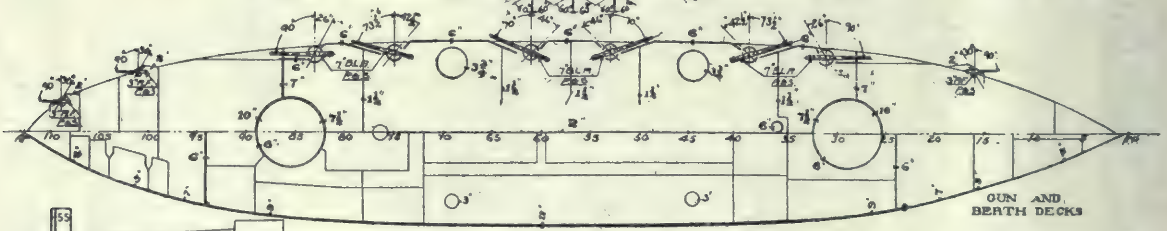

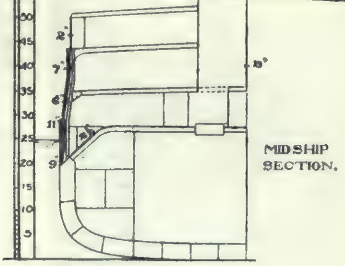

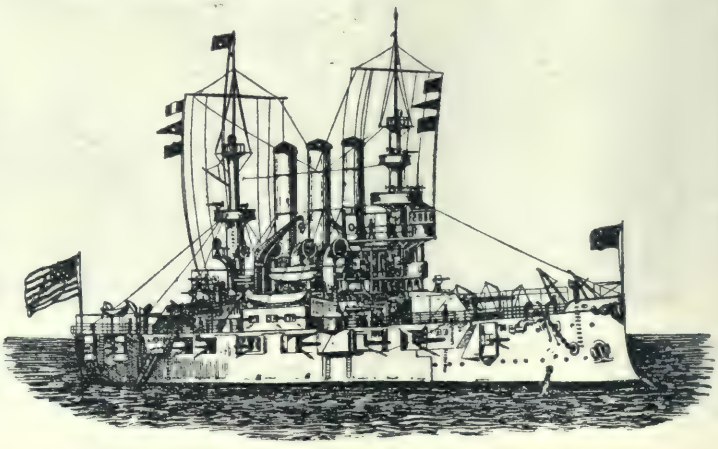

PLANS AND ELEVATIONS OF THE UNITED STATES BATTLESHIP, "CONNECTICUT."

than those for the previous financial year. The sum to be devoted to new construction is 25,806,802 lire (£1,032,272), being £63,065 less than that for 1903-04. One new battleship of the *Vittorio Emanuele* type is to be laid down, fourteen torpedo-boats, and four submarines.

RUSSIA.

The battleship *Imperator Alexander II.*, is being thoroughly refitted, and a great deal of the woodwork is being replaced by thin steel. Questions of rearmament and redistribution of magazines are being considered by the Constructional Committee, and the whole is expected to cost £125,000. The coast defence battleship *Admiral Grieg* has also been thoroughly refitted.

There are at the present moment twenty-four torpedo-boats being completed by the Admiralty yards at St. Petersburg. Of these twelve were begun by the Neva Works and twelve by the Baltic.

MINOR NAVIES.

DENMARK.

The naval estimates for the year 1904–1905 total kr. 5,774,646 (£317,605 10s.). The new battleship of the *Herluf Trolle* class will be known as the *Peder Skram.*

SWEDEN.

The total of the Ordinary and Extraordinary Budget for the Navy for 1905, is kr. 21,533,853 (£1,184,362). Of this kr. 6,062,550 (£333,440) will be devoted to the completion of the shipbuilding programme. The vessels under construction are the *Oscar II.*, the *Fylgia*, one destroyer of the *Mode* class, building by Thornycroft, and one torpedo-boat, the *Plejad*. There is also a small scout, the *Carl Edholm*, building at Karlskrona.

NORWAY.

The Naval Budget for 1904–5 totals kr. 3,943,000 (£216,865), of which only kr. 425,000 (£23,375), is to be devoted to new construction. Three torpedo-boats and a submarine are the only vessels projected.

BRAZIL.

The Congress of the United States of Brazil has drawn up the following programme for the re-construction of the Brazilian Navy. Three battleships of from 12,500 to 13,000 tons displacement; thre armoured cruisers of 9,200 to 9,700 tons displacement; six torpedo-boat destroyers of 400 tons displacement; six torpeodo-boats of 130 tons and six of 50 tons displacement, with three submarines. The contracts for these vessels shall, wherever possible, be awarded to English firms.

CHILI.

A submarine, named the *Urzua Cruzat* has been completed and is undergoing trials.

THE UNITED STATES BATTLESHIP "CONNECTICUT.

The four new battleships which America has added to her fleet within the past six weeks have already been dealt with in PAGE'S WEEKLY. I am indebted to the American Syren for the accompanying drawing and plans of the *Connecticut*, and would call attention to several innovations which were employed in launching that vessel from the Brooklyn Navy-yard as compared with the usual methods employed on the Atlantic Coast. One of these, noted by the Iron Age, was the employment of sandbags in connection with the keel blocks. These were placed between the blocks directly underneath the keel and the top blocks of the cribbing. When the time finally arrived for the cutting of the shoe pieces, releasing the ship on her cradle from the shore anchorages, these bags were cut, and as the sand flowed out the keel blocks were easily knocked away. Another feature of interest was the adoption of dog shores for the purpose of holding the vessel in case the shoe pieces or land anchorages, gave way prematurely. These were heavy timbers fastened to the ground and placed in a diagonal position, with their upper ends pointing toward blocks bolted to the vessel. In case of the vessel starting down the ways prematurely the function of the dog shores would have been to catch it and hold it until arrangements for the launching were completed. An inverted hydraulic jack was placed against the side of the ship near the holding blocks to serve as a means of disengaging the dog shores in the event of their use. The shore pieces held, however, and this provision against emergency was not given a test. To check the progress of the vessel after reaching the water a stout breakwater was fastened to her stern.

THE ENGINEER'S BOOK OF THE WEEK.

"WORK AND WAGES."*

THE author of this work has had the good fortune or perhaps, one should write, the good sense, to produce a book on a very live topic. Since the tariff reformers raised the standard of revolt against foreign competition, an authoritative pronouncement on this subject has been clearly needed. Those who have some expert knowledge of the subject, may read the work with profit, although they may not always find themselves in agreement with the author. Seeing, however, that Mr. Chapman writes for the many and not for the few, he is wise in devoting his first chapter to dissipating the cloud of fallacy by which the subject is so frequently obscured.

Lord Brassey, in his introduction, points out that the first volume may be regarded as a sequel to his own writings on work and wages, and indeed as bringing the subject up to date. A brief summary would describe the volume as dealing with the industrial efficiencies of the leading countries, and a further volume will deal with the labour problem under other aspects. There is only one disadvantage which attaches to a writer on economics dealing with questions affecting various industries, and that is the lack of expert technical knowledge. Similarly, the man who possesses the latter, recks little of the science of economics. And as one cannot hope to find a writer whose knowledge compasses the whole field of knowledge it is well to fall back on a sound economist who knows his limitations, who confines his work to collating and comparing collective results; who is capable of weighing evidence, of separating the important from the unimportant; and is content to find explanations for the main features of industrial development.

It is to this last that the author has applied himself, and he writes much that is suggestive as well as interesting. He sets out with an explanation of the conditions of international trade and shows that no figures are more dangerous on which to base conclusions, than those relating to imports and exports. Subsequent chapters deal with the conditions of trade in different industries. In the coal trade, he tells us, as might be expected, that competition has as yet given us no reason for fear. In the iron and steel industries the author shows that, comparing our natural resources with those of other countries, Great Britain has no cause for despondency. All the same, the figures relating to the United States and Germany clearly call for examination. The advance of the United States to the position of supremacy it now holds in this industry is correctly ascribed by Mr. Chapman to enormous self-contained resources, and a high level of efficiency. To Germany, England yields nothing in efficiency, although admitting the superior organisation of the industry. German workers are below the British standard, and in the United States, too, the workers are held to be inferior to those in British establishments. And be it added that Sir Lowthian Bell could find no smelting works in either the Old World or the New which could compare with those of Middlesbrough.

In shipbuilding, British superiority is, of course, well marked. It would be indeed remarkable if a country which holds the sea carrying trade in the hollow of its hand, were to import its ships. England, in fact, produced 64 per cent. of the world's ships as recently as 1900. America is, however, making supreme efforts to build ships economically, and in many respects, such as design of works, machinery employed, application of power, the United States admittedly takes first place. And over Germany we can claim no superiority of workmanship. Yet, granting this, the balance of advantage rests with England. If we have not yet quite reached the stage of manufacturing instead of building ships, we have got very near it, and in spite of the difficulties in the way standardising may come at last. In this industry it goes without saying that the finest and best trained workmen are to be found in England.

Knowing our dependence on America for some of the most useful machinery, engineers will not dispute the contention as to the serious character of United States rivalry in the engineering trades. The locomotive agricultural implements, machine tools and electric plant trades are selected by the author for the examination.

The locomotive question is a sore point with some of us, and it is as well to be assured that whatever else England lacks, in efficiency at least her manufacturers still hold their own in this field. The book ought to be read by all who are anxious for an unimpassioned presentation of facts bearing on the question of the hour.

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* "Work and Wages." Part I.—Foreign competition, by Sydney J. Chapman, M.A.—With an Introduction by Lord Brassey. Longmans, Green, and Co. 7s. 6d. net.

THE POND STEEL-TYRED CAR-WHEEL LATHE.

A NEW equipment of a Steel-Tyred Car-wheel Lathe is just announced, which makes it possible for each lathe to turn out thirty-six pairs of wheels weekly.

We are able to describe this interesting development by the courtesy of the Niles-Bement-Pond Company, of New York, and 23–25, Victoria Street, S.W.

The lathes are set level with the floor so that wheels can be easily rolled in, and are provided with pits in front for the convenience of the operators. Tracks consisting of ⅝ in. by 2 in. bar iron planed with a groove for the wheel flanges lead to each lathe. The wheels are rolled in on the longitudinal track and at the junctions of this track with each of the various tracks leading to the machines, air lifts, operated by foot valves in the floor, are provided, which enable the wheels to be quickly transferred from one track to another. In rolling the wheels into the lathes, the tracks save much time as the wheels are rolled in absolutely central.

The wheels first go to the journal lathe, if the journals need truing, and then to the car-wheel lathes. In putting a pair of wheels in the car-wheel lathe, first the bushings are put on the journals, then the wheels are rolled in, and the tailstocks brought up. The adjustment of the new "Sure-Grip" driver is the next step, and to the use of this patented driver a large part of the increase in production is due. The chuck-jaws in the face plates hold the tyres rigidly and by screwing up the set-screws of the "Sure-Grip" driver, the tyres are firmly wedged between the driving plates and the chuck-jaws so that the full power of the machine can be utilised.

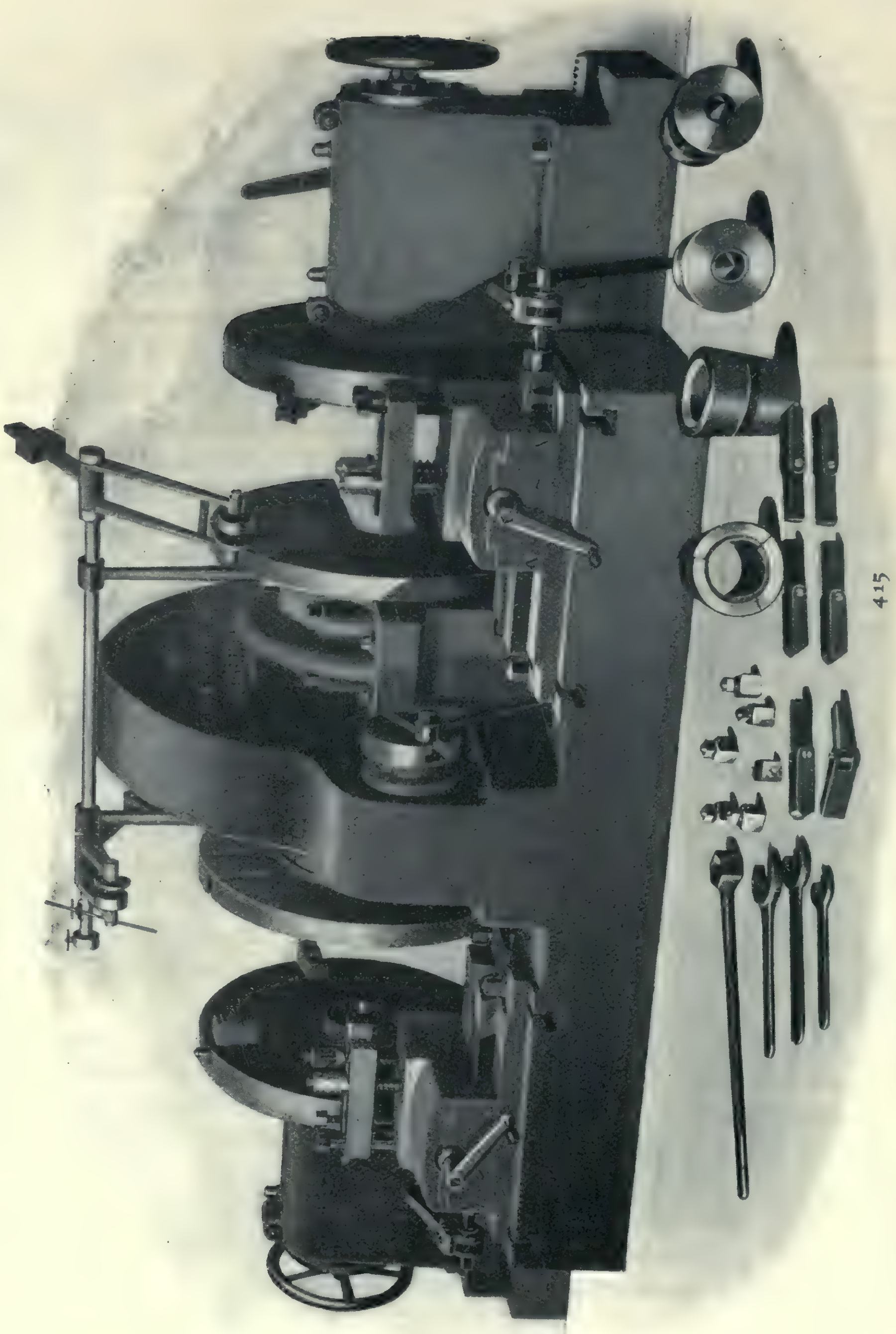
The self-hardening steel used for the tools is 3 in. by 1¼ in., which is large enough to prevent springing or breaking, and the large cross section also has the advantage of carrying away rapidly the heat generated at the cutting edge Each lathe is usually equipped with at least six right-hand and six left-hand roughing tools to provide for grinding, dressing, etc.; two right-hand and two left-hand of each kind of flange tool, two sets of scraper blades, and twenty-four cold chisels of 1¼ in. steel dressed narrow and blunt, and a 5-lb. hammer to take out chilled spots. The drawing on page 489 shows the various tools.

The cut on the tread is started next to the flange, using the round-nose roughing tool with ⅜ in. to ½ in. feed or whatever the tool will stand. This operation takes from twenty-four to forty-five minutes. The outer edge of the tyre should be rounded and the scraper applied to the tread, which is smoothed up in one or two revolutions of the lathe. This consumes five or six minutes, and the tread is finished.

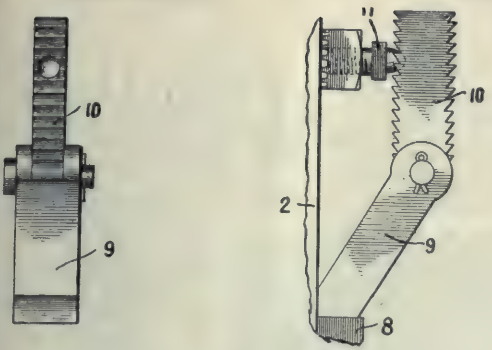
Then the top of flange is cut down to proper height, using the flat-nose tool. The outside of the flange is roughed to something near shape with the round-nose tool and it is reduced if too thick. It is finished with the flange tool which is the exact shape of one-half of the flange. Next the back of the flange is roughed as before, and is finished with the other flange tool. The flange tools are kept in shape by grinding on the top.

It has been found that the output of the lathes is the greatest when the feed and depth of cut are at maximum, rather than when a high-speed is used. The usual speed is from 6 to 10 ft per minute or whatever the tool will stand.

The actual time of taking out a pair of wheels and putting in another pair should not consume more than eight to twelve minutes with wheels convenient to the lathe. With the equipment described, an experienced operator can turn from five to seven pairs in ten hours, or an average of thirty-six pairs a week. Wheels have been turned, however, in less than forty-five minutes.

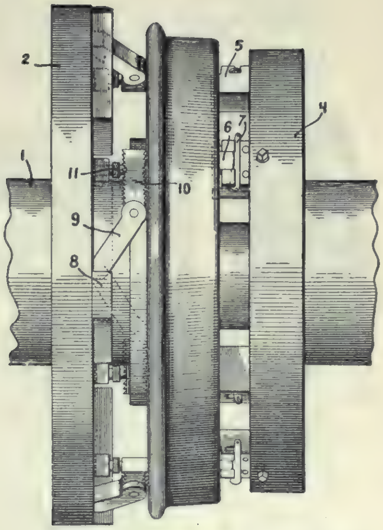


THE POND STEEL-TYRED CAR-WHEEL LATHE.

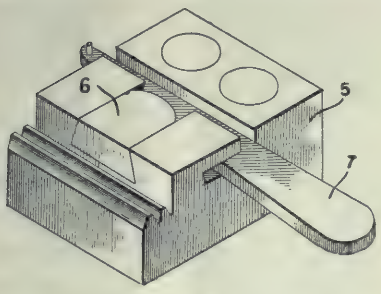


"SURE GRIP" DRIVER

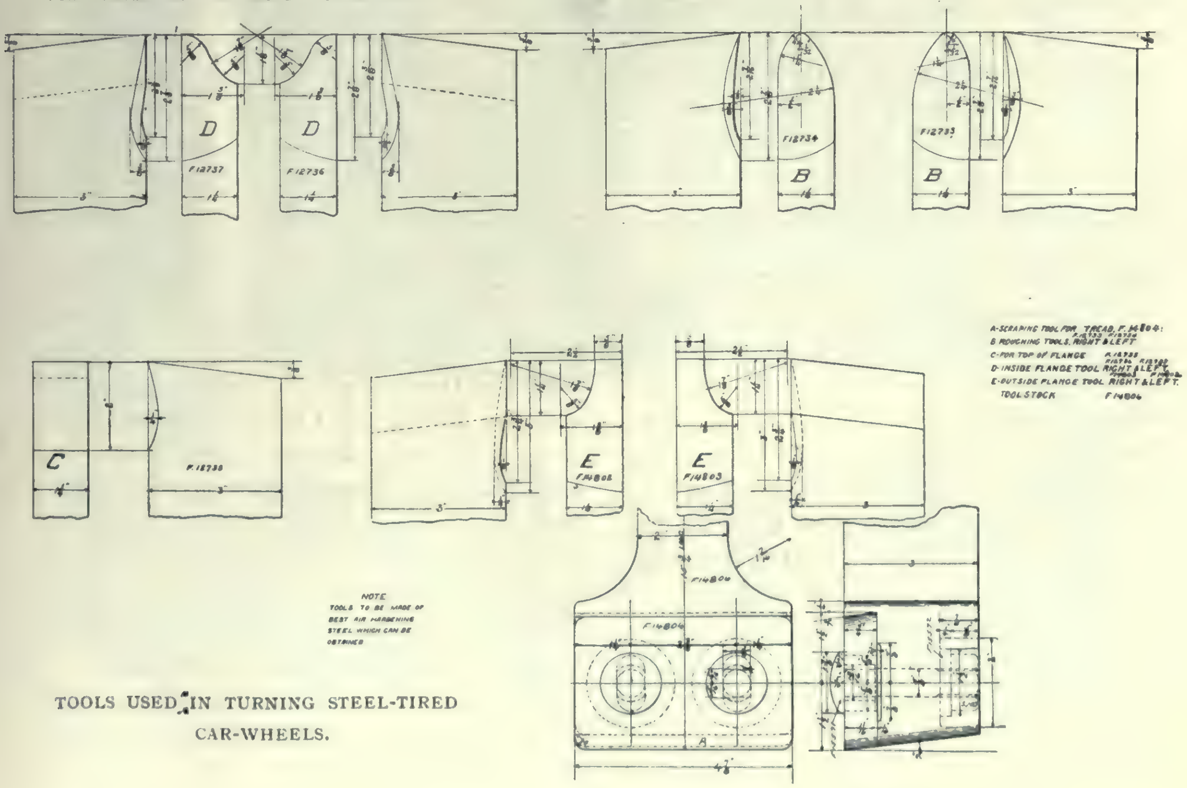
Set Screw 11 Forces the Teeth Into the Tire
Piece 8 is Bolted to the Driver-Plate



APPLICATION OF "SURE-GRIP" DRIVER



CHUCK-JAW ATTACHMENT
With Arrangement
For Preventing Tire Being Crowded Off



A-SCRAPING TOOL FOR TREAD, F. 14804:
B ROUGHING TOOLS, RIGHT & LEFT F12733 F12734
C-FOR TOP OF FLANGE F12730
D-INSIDE FLANGE TOOL RIGHT & LEFT F12736 F12737
E-OUTSIDE FLANGE TOOL RIGHT & LEFT. F14803 F14802
TOOL STOCK F14804

NOTE
TOOLS TO BE MADE OF BEST AIR HARDENING STEEL WHICH CAN BE OBTAINED

TOOLS USED IN TURNING STEEL-TIRED CAR-WHEELS.

SIR LOWTHIAN BELL, BART., J.P., D.L., F.R.S., LL.D.,

The newly elected President of the Institution of Mining Engineers.

SIR LOWTHIAN BELL was born at Newcastle-on-Tyne in 1816. He obtained his primary education at the leading school in his native town and subsequently on the Continent, where he acquired an intimate knowledge of German and Danish. On returning to England he was enrolled as a student at the Edinburgh University, where his studies were mainly of a scientific nature.

Upon the conclusion of his University training he went to France to prosecute further studies at the Sorbonne, Paris; here he had the advantage of hearing the lectures of Thénard, Dumas, and Dulong. Sir Lowthian has travelled extensively. In the years 1839–40 he covered a distance of over 12,000 miles, examining *en route* the most important seats of iron manufacture in France, Belgium, Germany, Poland and Austria. While on this tour he made a special visit to the blast furnace at Wasseralfingen, his object being to inspect the recently discovered method of utilising waste furnace gas.

On attaining his twentieth year he was placed at the iron and chemical works at Walker-on-Tyne, but the actual commencement of his business career may be dated from 1850, when he joined the chemical works at Washington, Durham, which firm was then under the control of his father-in-law, the late Mr. H. L. Pattison, F.R.S. Two years later, in partnership with his two brothers, he founded the Clarence Iron Works, now one of the foremost metallurgical establishments on the Tees.

Referring to the growth of the Iron and Steel Institute, Sir Lowthian Bell recently remarked: "In the year 1868 the Middlesbrough ironmasters were in the habit of meeting those of Newcastle-on-Tyne, an older seat of the iron trade than its rival on the Tees. The object of these meetings was of a purely commercial character. The secretary of this body, a gentleman of scientific training, suggested the addition of science to commerce. Thereupon I was requested to read a short address on the subject at Newcastle. This was followed by a few friends meeting at my house, of which Mr. William Whitwell and myself are the sole survivors. Such was the origin of the Iron and Steel Institute."

Sir Lowthian has held office as sheriff, and in 1854 he was elected chief magistrate of Newcastle. In 1863 he was again elected mayor in order to receive the members of the British Association, who in that year paid an official visit to the town. From 1875 to 1880 he sat as Member of Parliament for the borough of Hartlepool. In 1876 he served as a juror at the Centennial Exposition at Philadelphia, acting in a similar capacity two years later at the Paris Exhibition. In acknowledgment of his services in this direction he was elected honorary member of the American Philosophical Institution, and officer of the Legion of Honour.

He is a member of a number of learned societies, including the Royal Society of Great Britain, and that of Sweden, the Iron and Steel Institute, Institution of Mechanical Engineers, and the Society of Chemical Industry. He has also received honorary degrees from the University of Edinburgh, the College of Science Newcastle-on-Tyne, and the University of Leeds. He is a frequent contributor to the Transactions of the Societies, and the author of the well-known book, "Chemistry of Blast Furnaces: Principles of the Manufacture of Iron and Steel."

A baronetcy was conferred upon him in 1885 in recognition of his distinguished services to science and industry.

SIR LOWTHIAN BELL, BART., J.P., D.L., F.R.S., LL.D.

THE WEEK'S SHIPBUILDING.

(BY OUR CLYDE CORRESPONDENT.)

Retrospect and Prospect.

The shipbuilding returns for September, and also Lloyd's returns for the quarter, have been issued since our last notes were published. In Scotland, the chief centre, the September launches were 31 vessels of 44,600 tons, and the September contracts aggregated about 40,000 tons. The nine months' output of Scotland is thus brought up to 312,275 tons, which is the smallest nine-months' total since 1897. And yet all the time the Clyde has been reported to be better employed than the other centres. The Tees is ahead on the nine months by 32,700 tons, and Hartlepool is ahead by 13,000 tons. In both these districts the increase is due to the spasmodic demand for "tramps," which set in towards the end of last year, lasted for a couple of months or so, and then suddenly died away. In the whole United Kingdom the output of the nine months was 938,780, compared with 884,797 tons in the first nine months of last year. The quantity of work on hand at the beginning of the fourth quarter is 1,046,308 tons. This is merchant work in the United Kingdom, according to Lloyd's returns, "under construction." It does not, however, include unclassed craft under 100 tons, nor warships, and the amount of the latter under construction may be taken at 342,930 tons. But all this work is very unevenly distributed, and many of the yards have nothing whatever to look forward to during the winter. It is stated that there has been some quiet contracting going on in the north of late which has not been reported, and it is known that during September a good many inquiries came in from the Colonies, and also some from foreigners but, after all, the Colonial and foreign business in new ships is small in comparison with our producing capacity. At the time of writing there is no change in the price of ship plates, but angles have been reduced by Scotch makers 5s. per ton to £5 less 5 per cent. The chief incident at the opening of the new quarter was the placing of the Admiralty contracts for the two new battleships of the *Lord Nelson* class—one with Messrs. William Beardmore and Co., Ltd., Glasgow, and one with Palmer's Shipbuilding Company, Jarrow-on-Tyne.

Beardmore's New Yard.

The placing of an order for one of the new battleships gives a sort of dramatic opening to the great shipbuilding establishment which Messrs. William Beardmore and Co., Ltd., have been for some time past constructing at Dalmuir on the Clyde, about eight miles west of Glasgow. To these new works they now remove the shipbuilding and engineering business formerly carried on by the historic firm of Robert Napier and Sons, which was absorbed by William Beardmore and Co. a couple of years ago. The old Napier yard and engine shops are for sale. The new Beardmore yard and engine shops are probably the most remarkable in the kingdom, if not in the world, having been founded on the ripened experience of the whole world's shipbuilding and engineering enterprise. These works cover an area of about 90 acres, and have a river frontage of close upon a mile—4,920 ft. The berths are numerous, and two of them are suitable for building vessels 1,000 ft. in length and 100 ft. in beam, for launching which there is a deep-water run of 1,500 ft. The assembling of electric cranes and machine tools of all sorts is marvellous, alike in the shipyard and the allied engine shops. Everything is driven by electricity, and everything is devised for efficiency and economy. The machinery shops cover an area of about 15 acres, and have glazed roofs affording perfect natural lighting throughout. Here are machine tools capable of dealing with plates up to 40 ft. in length, 7½ ft. in width, and 2 in. in thickness, and with framing of corresponding proportions. The engineering and boilermaking works cover an area of 233,210 sq. ft., and are divided into five bays, each 730 ft. long, and collectively 330 ft. wide. These shops are equipped with electric tools and labour-saving devices in every direction. The fitting-out basin is 900 ft. long, 360 ft. wide, is constructed of concrete with timber wharves at the entrance, and has a water area of 7½ acres. On the west side of this basin and near the engine shops is a cantilever crane capable of lifting a weight of 150 tons at an outreach of 72 ft., a feat practically impossible with shears. By means of this crane, machinery or boilers weighing 150 tons can be placed on the outer part of a ship of 80 ft. beam. This crane; like all the other machinery in the establishment, is operated by electricity.

Dredger Production.

For the production of dredgers, sand pumps and the like, the name of William Simons and Co., Ltd., Renfrew, is well known. This firm have evolved a new turbine which, it is expected, will give better results than any of the now existing types. This turbine is the invention of Mr. J. A. MacKenzie, one of the firm's engineering staff, and it has the advantage of being reversible. Mr. MacKenzie began with a model of about 5 b.h.p., which commended itself so much to Messrs. Simons that they made on the same plan a turbine of 120 b.h.p. This proving satisfactory, they decided to build an engine of 350 b.h.p. on the triple-expansion principle, and this is now under construction. The firm propose to apply the new turbine only to auxiliary machinery in their yard, and on board the particular vessels they build, but it can, if developed, be also used for the propelling of steamers, in which, it is claimed, it will effect a saving of 25 per cent. over the ordinary marine engine. It has no reciprocating parts, runs at a very high speed, and can be reversed without the assistance of an "astern" turbine. Extensive improvements in the shipyard of Messrs. William Simons and Co. are now almost completed, consisting principally of new engine and boiler shops. The new engine shop is 273 ft. in length, and has a breadth under three roofs of 125 ft. It is an extension of the old shop, and is so arranged that a line of narrow-gauge railway runs through both old and new parts, rendering the handling of details of machinery very convenient. Above each of the bays there is a powerful electric travelling crane for the transport of machinery. The shop has been fitted with the newest plant and tools. The new boiler shop is 200 ft. long, and has a width under two roofs of 95 ft. It is an entirely new structure, and is supplied with powerful riveting, drilling, and planing machines, capable of dealing with boiler plates up to 1¾ in. in thickness. It also has overhead electric travelling cranes. The new shops have a complete installation of electric light.

A new dredger which Messrs. Simons are building for the Government of Natal will be 500 tons larger than the *Nautilus*, which has done excellent work at Durban, deepening the waterway to such an extent that Union Castle liners can now enter the harbour. The previous Simons' dredgers all did well on the bar at Durban, but when the powerful *Nautilus* arrived it was found that she could continue at work even when a considerable sea was running, and dredge to a greater depth than any of her predecessors. Messrs. Simons have contracts on hand for a powerful dredger for the Admiralty, another for the Indian Government, and a combined bucket-and-pump dredger for the New Zealand Government.

Wastage of Shipping.

The statistical summary of vessels totally lost, condemned, etc., shows that during 1903, the gross reduction in the effective mercantile marine of the world amounted to 922 vessels of 779,803 tons, excluding all vessels of less than 100 tons. Of this total, 326 vessels of 479,081 tons were steamers, and 596 of 300,722 tons were sailing vessels. In steamers, the present return exceeds the average of the previous ten years by 33 vessels and 93,671 tons; in sailing vessels it is below the average by 148 vessels of 50,631 tons. In percentage of the total vessels owned, as recorded in Lloyd's Register Book, not only do the sailing figures vary but slightly, but the proportion of steamers lost is less than for the two previous quinquennial averages. The reduction is accounted for by the great increase of steam tonnage during recent years, the United Kingdom steam tonnage alone having during the past ten years increased by over 4½ million tons, or more than 48½ per cent. The percentage lost, etc., of vessels owned is as follows: Period 1893–1897: steam, No. 2·13, tons 2·08; sail, No. 5·07, tons 4·80. Period 1898–1902: steam, No. 1·90, tons 1·86; sail, No. 4·93, tons 4·60. Period 1903: steam, No. 1·84, tons 1·76; sail, No. 4·89, tons 4·66. Strandings and casualties, comprised under the term "wrecked," are much the most prolific cause of disaster. To such casualties are attributable 36·8 per cent. of the losses of steamers, and 43 per cent. of the losses of sailing vessels. The next most common termination of a vessel's career is by condemnation and breaking up, 27·3 per cent. of the steamers, and about 23·7 of the sailing vessels removed from the merchant fleet of the world being accounted for in this manner. Of the remaining causes of loss, collision is the most general for steamers, 13·8 per cent., while, for sailing vessels, cases of abandonment at sea come next in order of frequency 8·9 per cent. Cases of abandoned, foundered, and missing vessels are frequently more or less similar in the circumstances of loss. Collectively they comprehend 18·4 per cent. of the steamers and 25·5 per cent. of the sailing vessels removed from the mercantile marine during 1903.

Comparative Wastes.

The return compiled by Lloyd's Register enables a comparison to be made between the percentages of loss suffered by each of the principal merchant navies in the world. Great as the absolute annual loss of vessels belonging to the United Kingdom seems, it forms a very moderate percentage of the mercantile marine of the country, and compares favourably with the losses sustained by other leading maritime countries. The merchant navies which exceed a total of 1,000,000 tons are those of the United Kingdom, the British Colonies, the United States of America, France

Germany, Italy, and Norway. Of these countries the United Kingdom shows the smallest percentage of loss, viz., 1·69 of the vessels owned; Germany follows with 2·05 per cent., and Norway is the highest with 5·64 per cent. As regards steamers, both the percentage for the United Kingdom and for the other six countries together stand at 1·45. For sailing vessels, the percentage of loss for the United Kingdom is 2·84, and 4·60 for the other six countries. The average yearly loss during the last five years of vessels owned in the United Kingdom, has been 1·75 per cent., as compared with 3·40 per cent. of vessels owned by the other six countries together. These percentages are for vessels actually lost, and exclude all cases of breaking up, condemnation, etc., not known to be consequent upon casualty or stress of weather. Steamers have a much greater immunity from disaster than sailing vessels. During 1903 the losses of steamers belonging to the chief maritime countries of Europe, to the British Colonies, and to the United States of America, amount only to 1·36 per cent. of the number owned, while the losses of sailing vessels reach 4·46 per cent. As regards vessels owned in the United Kingdom, the number of casualties comprised in these classes in the return, viz. 29, is the lowest recorded during the 13 years of the records.

Another Turbine.

In a recent number we referred to the introduction of the turbine into the Indian coasting trade. A second turbine steamer for the British India Company has since been launched by Messrs. William Denny and Brothers, Dumbarton, viz., the turbine steamer *Linga*. She is the second of four turbine vessels built for the British India Steam Navigation Company's special trade. The principal dimensions of the vessel are: length, 275 ft.; breadth, 44 ft.; depth, 25 ft. 8 in. She is of the poop, bridge, and forecastle type, having accommodation for first-class passengers in the bridge, for second-class in the poop, and for crew in the forecastle. The main deck is arranged for the carrying of native passengers, for whose comfort and convenience every arrangement has been made. All the passenger accommodation is ventilated by means of electric fans in addition to natural ventilation, so that an ample current of air will be provided under all conditions. The turbines are supplied by the Parsons' Marine Steam Turbine Company, while the boilers and the remainder of the propelling machinery are supplied by Messrs Denny and Co., of Dumbarton.

German Shipbuilding.

The keel of the first leviathan intermediate steamer has been laid in Germany for the Hamburg-American Line, a sister ship to one now being constructed by Harland and Wolff, at Belfast. With a length of 676 ft. between perpendiculars, a beam of 77 ft. and a depth moulded of 54 ft. the vessel when loaded to a draught of 33 ft. will have a displacement of 35,000 tons. She will carry a great population and a very large cargo. Her engines will develop 17,000 i.h.p., calculated to give a speed of 17 knots. Eight main double-ended boilers will be worked on the Howden forced-draught system, as in all the Hamburg-American steamers. The builders are the Vulcan Company of Stettin, who have constructed all the high-speed Atlantic liners for German lines. The *Lahn*, the last mail steamer built at Fairfield for the North German Lloyd, was followed by the *Spree* and the *Havel*, the first high-speed ships built in Germany. Since then the German firm have built the *Kaiser Wilhelm der Grosse*, the *Deutschland*, the *Kronprinz*, and the *Kaiser Wilhelm II*. British builders will probably lose the orders for those large intermediate vessels.

Boilers and Warships.

In the three new cruisers to be built in the Dockyards, the feature of the machinery is the adoption of water-tube boilers for the complete installation. This is a reversion to the practice in use when the Boiler Committee was appointed. The power to be developed for driving the ship at full speed is 27,000 i.h.p. Babcock and Wilcox boilers will number 25, have 73,000 sq. ft. of heating surface and 1,950 sq. ft. of grate area; while the Yarrow boilers will number 26, and have a collective heating surface of 81,000 sq. ft. and a grate area of 1,350 sq. ft. The Yarrow boilers are, therefore, to develop 20 h.p. per sq. ft. of grate as compared with 14 h.p. in the case of the Babcock and Wilcox boilers. In the Yarrow boilers, however, the heating surface is much greater, there being an allowance of 3 sq. ft. per i.h.p., to be developed, as compared with 2·7 sq. ft. in the other case. This difference is due to the design of the boiler and to the result of experiments which established the fact that greater efficiency is obtained by minimising the grate area in relation to the heating surface. The weight of the Yarrow installation is 20 tons less than with the other type, the ratio being 11·2 i.h.p. per ton of all machinery.

Meeting of the Iron and Steel Institute at New York.

AT the New York meeting of the Iron and Steel Institute on Wednesday, a number of interesting papers were read by metallurgists well known on both sides of the Atlantic.

Mr. Andrew Carnegie presided over a large gathering, and an excellent programme was carried out.

Abstracts of some of the papers contributed at this meeting will be found below.

PRIMITIVE SMELTING WORKS.

What may fairly be described as a picturesque paper on "A West African Smelting House," was presented by Mr. C. V. Bellamy, M.Inst. C.E., M.I. Mech. E., F.G.S., Director of Public Works, Lagos, and to this was annexed an appendix containing analyses of the specimens described by Mr. F. W. Harbord, Assoc. R.S.M., F.I.C. As the author remarks in his paper, "it is seldom that smelting works, conducted after the crude manner of the ancients, are met with ; and it is difficult to realise that such places can still have an existence in a part of the world which is within twenty days of the great manufacturing centres of Europe." The members had an opportunity of hearing all about smelting under extraordinary rather than progressive conditions. Although the smelting works described are situated within one short day's march of Oyo, the capital of the Yoruba country and the seat of the Alaffin or king of that nation, it is only recently that they have been visited by a white man, for the first time, in the person of the Rev. Mr. Pinnock, the representative at Oyo of the Baptist Missions. It is to this gentleman that the author was indebted for the information which led him to visit the place in the company of Mr. J. E. Stone, of the Public Works Department, Lagos.

Transporting his hearers in imagination to a small village in the hinterland of Lagos, Mr. Bellamy shows that the inhabitants have been engaged in the extraction of iron for generations past, and that the methods employed are probably the same as those practised by the earliest workers in this metal. There is no suspicion throughout the whole of this small community of any modern improvements, and there is nothing to suggest in the character of their implements or appliances that they have been in any way influenced by suggestions from the outer world. With the aid of photo. illustrations and diagrams a full explanation is given of these processes followed. The cupolas employed are built entirely of clay in mass, and each occupies a circular space, whose diameter is from 7 to $7\frac{1}{2}$ ft. The interior of the cupola measures in its greatest diameter about 2 ft. 6 in., at a height which corresponds to the floor level outside and the floor or bottom of the furnace, which is rounded, is about 2 ft. below this point. The height of the furnace is about 5 ft., and the space is of an elongated egg-shape in section ; the surface is rendered smooth with clay. The process of smelting occupies a period of about thirty-six hours. A cupola is charged about daylight of one day, and is drawn off shortly after sunset of the following day.

The weight of each pig of smelted metal as the yield of each operation would be, as near as one could judge, between 70 and 80 lb. Taking the average yield at say, 75 lb., the ratio of metal to crude ore is as 75 : 162 = 46 per cent. That is to say, that for every 100 lb. of ore thrown into the cupola 46 lb. of metal are produced. The remaining 54 per cent. of ore comes away in clinker from which the necessary flux for subsequent smeltings is selected, and the residue thrown to spoil.

Probably the most remarkable feature in the whole of the process is this use of selected clinker for a flux. This may throw light upon what is now subsequently a matter of doubt—namely, the medium employed by the ancients in their smelting operations.

HIGH-SPEED TOOL STEEL.

An able paper on "The Development and Use of High-speed Tool Steel" was presented by Mr. J. M. Gledhill, who recently gave the readers of PAGE'S MAGAZINE a resumé of the progress made in this important field. Mr. Gledhill refers at the close of his paper to the complete revolution in the design of machine tools which has been rendered necessary in order to cope with the extraordinary increased cutting powers of the latest rapid cutting steels. It is impossible that the design of machine tools can remain on the old lines, since the difference between them and the cutting powers of the steel is so abnormal, and a sphere of immense area for the redesigning of machine tools is opened out to the ingenuity of the world's engineers. That much has been already done is admitted, but the work is naturally of such a nature that only time and experience will accomplish, gradually enabling as near as possible the relative powers of the steel and machines to be equated. The powers of the cutting steel and the the machine should be as nearly reciprocal as possible, for, given those conditions, manufactaurers place themselves in the most favourable position for the rapid and economical turn out of their products, and for best meeting their rivals in the open field of competition. Lastly, nothing approaching finality must be admitted by the steel-maker.

ACID OPEN-HEARTH MANIPULATION.

Details of further experiments on the above were presented by Mr. Andrew McWilliam, Assoc. R.S.M., Lecturer in Metallurgy at University College, Sheffield, and Mr. William H. Hatfield, Mappin Medallist, and Metallurgist to Messrs. John Crowley and Co., of Meadow Hall Iron and Steel Works, Sheffield. In their introduction the authors say:—

"At the 1902 May meeting of the Iron and Steel Institute the authors presented a paper on "The Elimination of Silicon in the Acid Open-Hearth, wherein they recorded a few typical examples of certain Siemens charges out of a very large number specially watched for the purposes of that research. The main deductions drawn from those experiments have been accepted in all the intelligent criticism during or after the discussion on the paper. One opinion, however, was rigidly held by all who mentioned the matter, with the single exception, perhaps, of Mr. Lange, and that was the necessity for the attainment and the maintenance of an abnormally high temperature in order that the percentage of silicon in the metallic bath might increase, or that an unusually large proportion of silicon might be retained in the metal. The original decision was arrived at on the results of scores of trials, and has since been the subject of frequent experiment. The authors still retain their opinion that although naturally a higher temperature will accelerate the (probable) action between the carbon of the steel and the excess silica of the slag, they then fairly proved, and have now abundantly confirmed the fact, that around the temperatures occurring in Siemens steel-making practice the chemical composition of the slag, particularly with regard to its acidity, is the factor which determines whether the percentage of silicon in the molten steel shall increase or decrease.

COMPARISON OF ANALYTICAL METHODS.

It is a well-known fact that the results of different analysts, when operating on the same identical sample of steel or iron, are far from concordant, and it not unfrequently happens that great annoyance and trouble in the commercial community are occasioned by these discrepancies.

Attempts have been made at various times to investigate the causes of such differences and to obtain more reliable methods of analysis. At the autumn meeting of the Iron and Steel Institute held in Glasgow in 1901, a paper read by Mr. Axel Wahlberg, of Stockholm, on the variations of carbon and phosphorus in steel billets, called attention to a striking lack of uniformity in the results obtained by different analysts for identical samples of steel, and Mr. Wahlberg suggested that the Iron and Steel Institute should recognise a standard analytical method.

In the course of the subsequent discussion it was suggested by Mr. J. E. Stead that on account of the differences in the results there seemed to be some necessity for further research, and proposed that the same analytical authorities should be constituted as a committee who should make further investigations, exchange their methods of analysis, and endeavour, if possible, to find out which was the best and most reliable.

The proposal was adopted, and the committee was formed, consisting of the proposer of the resolution, together with Baron Jüptner von Jonstorff and Mr. Dillner as members. Subsequently Mr. Andrew A. Blair, representing America, was also appointed a member of the same body. These gentlemen now presented independent reports based upon further investigation. Each analyst had been supplied with homogeneous samples of borings taken from the lower ends of ingots containing respectively about 0·1 per cent., 0·5 per cent., 1·0 per cent., and 1·5 per cent. of carbon. Each member of the committee was asked to test his samples by his own approved method, and also by the methods employed by the other analysts.

The table on the following page gives the averages of the results obtained by working with the methods approved by each analyst.

It is pointed out that Baron H. von Jüptner has not tested the samples by the method he handed to the committee, and does not give any opinion as to what method he considers best.

Neither Baron H. von Jüptner nor Mr. Blair have employed the direct dry combustion process.

On comparing the above results it will be seen that the greater part of the determinations agree closely, but there are exceptions to this rule.

With regard to the methods for the determination of carbon, Mr. Dillner and Mr. Stead both agree in strongly recommending the two direct combustion

Table V.—Averages by Methods Approved by Each Analyst.

Carbon Determinations.

	H. 971.	M. 76.	H. 739.	L 422.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Dillner	1·46 1·45	1·02 1·01	0·45 0·44	0·10 0·10
Jüptner	*a* 1·57 *b* 1·52 *c* 1·439 *d* 1·450	1·105 1·071 1·046 1·068.	0·459 0·439 0·424 0·459	0·141 0·0936 0·140 0·142
Blair	1·415 1·412	1·040 1·038	0·434 0·432	0·098 0·097
Stead	1·44 1·40	1·035 1·020	0·420 0·420	0·10 0·096

Phosphorus Determinations.

	H. 971.	M. 76.	H. 739.	L 422.
Dillner	0·0225	0·0225	0·0230	0·030
Jüptner	0·0305	0·0320	0·0275	0·027
Blair	0·0190	0·0180	0·0220	0·026
Stead	0·0230	0·0245	0·0245	0·0295

processes. It will, however, be noticed that excepting in high-carbon steel the results obtained by the cupric chloride indirect method agree very closely with those obtained by the direct processes.

Theoretically the wet and dry combustion processes should give the most trustworthy results.

With regard to the phosphorus determinations, the results are again somewhat variable.

Mr. Blair's results are generally lower than those obtained by the other analysts. The results of Messrs. Dillner and Stead agree throughout very closely, whereas those obtained by Baron H. von Jüptner are, with one exception, higher than the others. Theoretically there is no reason why they should not agree. They were all obtained by the molybdate process, Mr. Blair having determined the molybdenum precipitated volumetrically, whilst Baron H. von Jüptner adopted a method which slightly differs from that of Messrs. Dillner and Stead in the system of weighing.

The committee are continuing their investigations, and are endeavouring to ascertain whether or not hydrocarbon gases do escape when steel is dissolved in cupric potassium chloride, and the reasons for the discrepancies shown above, the results of which will be presented on some future occasion.

If one of the numerous engines acting intermittently, and employed in industrial operations, particularly at steel works or at mines, be carefully watched during working, it is difficult to avoid being struck by the enormous volumes of steam which such engines discharge, with total loss, into the atmosphere.

Certain peculiarities, inherent to the method by which such engines work, render the condensation of this waste steam a matter of difficulty, or minimise the advantages to be derived therefrom, hence in many of them it is allowed to escape freely. On the other hand, it is often impossible, for similar reasons, to adapt to these machines the many improvements which have been applied to other steam engines of the piston type; multiple expansion, the use of superheated steam, etc.

The result is that the steam consumption of such engines is relatively very high. Thus it is particularly noticeable in steelworks, where, without counting the numerous secondary machines which discharge free steam, the reversing engines in the rolling-mills alone will discharge steam into the atmosphere, absolutely uselessly, to the extent of 35,000 to 45,000 lb. of steam per hour.

Now, if the difference between the pressure, at the moment of escape, and that of a vacuum in a condenser, corresponding to 26·5 in. of mercury, be taken into consideration, this quantity of steam would be capable of developing, in theory, 1,700 to 2,200 h.p. Herein lies, therefore, a highly important source of energy, the recovery of which presents the greatest interest to modern industry, which seeks by every means to develop motive power under conditions of economy, both to reduce the cost of production and to withstand competition.

Mr. Rateau, Professor at the Ecole des Mines, Paris, has specially devoted himself to the interesting problem of the utilisation of exhaust steam, and has obtained highly remarkable results by means of the regenerative steam accumulator which he has devised, in combination with low-pressure turbines, which can be coupled directly to dynamo machines, pumps or centrifugal fans.

THE NATURE AND FUNCTIONS OF THE REGENERATIVE STEAM ACCUMULATOR.

The "primary machine"* discharges its exhaust steam intermittently; on the other hand, the turbine requires a regular supply of steam to feed it. The regenerative steam accumulator serves to effect this regulation of the steam supply.

The principle upon which the machine is based involves considerations as to the properties possessed by saturated steam and saturated liquids respectively, and of the heat exchanges which take place between the steam and the water, either directly or through the medium of metallic partitions. Under any determined conditions of pressure and temperature these two fluids—saturated steam on the one hand, and steam-saturated water on the other—composed as they are of similar molecules, preserve a reciprocal condition of equilibrium, such that any variation in the total heat of the system, which may result from a disturbance of this equilibrium, determines the transformation of either form of fluid into the other form, with a corresponding absorption of heat in the one case or liberation of heat in the other. Given this property, it follows that if the steam which is escaping intermittently be conducted into a receiver containing cast iron and water, the cast iron will absorb heat and occasion, upon its surface, the condensation of a certain quantity of steam, which remains in the state of saturated water. Owing to this condensation, the steam accumulates whenever an abundant supply arrives in the accumulator, and thus causes a slight elevation both of temperature and of pressure within the apparatus. When the supply of exhaust steam from the engine falls off or ceases, the steady call for steam for the turbine reduces the pressure, and so determines the condition of dis-equilibrium, the necessity for which has already been explained. The latent heat of the steam, held in reserve by the cast iron and the water, serves to vaporise anew a certain weight of water, and the steam is thus regenerated in the form of a constant supply. These exchanges take place with extreme rapidity, and the variations of temperature and pressure required for the condensation and regeneration of the steam in the interior of the accumulator correspond with these slight fluctuations which can be perfectly controlled by a careful adjustment of the materials contained in the apparatus and by regulating the escape valves. This is, in principle, the function of the Rateau regenerative accumulator. Its action can best be compared with that of the fly-wheel of an engine. It plays the same part as a reserve for heat; it

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* By "primary machine" is meant the source from which the accumulator derives its power.

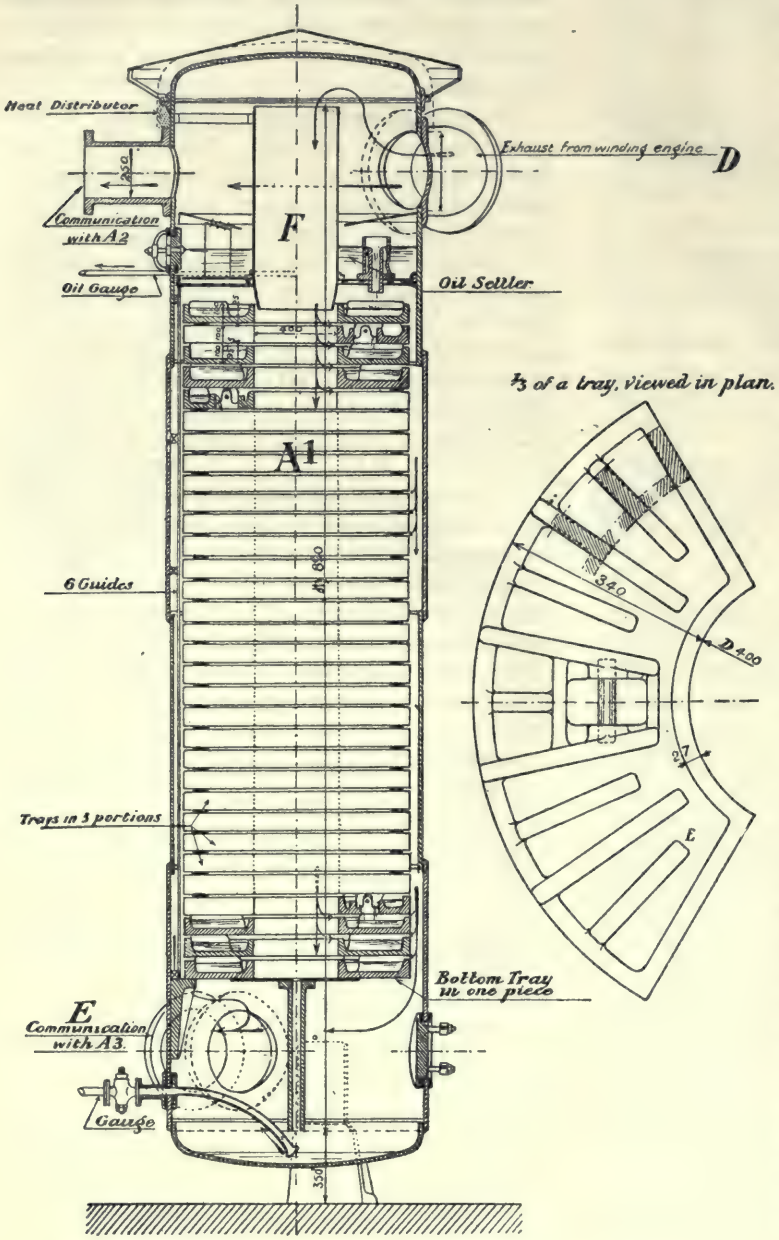


FIG. 1. PLAN OF COMPOUND ACCUMULATOR.

is, in fact, a true fly-wheel, for heat. The solid materials contained in the apparatus only serve, as we have seen, to facilitate the heat exchanges between the water and the steam. If, therefore, it were possible to determine these exchanges without using cast iron, a system at once more economical and of simpler construction would be realised. It will be seen presently that Mr. Rateau has attained this object by means of his water accumulator.

In practice the regenerative steam accumulator consists of a cylindrical vessel of sheet metal enclosing either a series of cast-iron trays or water only.

COMPOUND ACCUMULATOR WITH CAST-IRON TRAYS AND WATER.

This was the first type studied by Mr. Rateau, and the apparatus has already received the sanction of usage, an accumulator of this construction having been in actual operation at the Bruay Collieries, in the Pas-de-Calais, since August, 1902.

The compound accumulator consists of one or more cylindrical drums, disposed either horizontally or vertically, and enclosing a succession of cast-iron rays filled with water (fig. 1). The steam enters at D, and is distributed over the trays by the central passage F; the regularly maintained current of steam passes out at E. The drums are surrounded by a heat dissipator.

SIMPLE WATER ACCUMULATOR.

In this apparatus the heat fly-wheel consists simply of a mass of water. The economy in the cost of installation is highly important, as water costs nothing. This liquid is, however, a bad conductor; it would appear difficult to impart to it rapidly the large amount of heat corresponding with the latent heat of the steam to be condensed. Mr. Rateau has overcome this difficulty by occasioning, in the very centre of the liquid, energetic circulation, so as to increase the amount of contact taking place between the steam and the molecules of water.

The accumulator (fig. 2), consists of one or more horizontal cylindrical bodies composed of boiler plating, in the interior of which are arranged a number of tubes, A, of elliptical section, which traverse the cylinder from end to end, leaving between them the intertubular spaces B.

The steam enters the tubes A, and escapes violently into the spaces B, through a number of minute orifices driven in the sides of the tubes, The circulation of the water takes place in the direction of the arrows; the plates C, placed above the intertubular spaces B, interrupt the flow of the water, and prevents it being projected upwards. This flow of steam gives an extreme degree of emulsification to the water, which becomes steam-saturated. When the source of supply is stopped, the water liberates the latent heat it has absorbed, and the steam escapes in a steady stream; at the same time the regular demand of the low-pressure motor, which utilises this steady supply, reduced the pressure within the accumulator, and the steam still retained in the inner tubes continues to escape through the orifices, which confers on the liquid a degree of circulatory motion that facilitates the liberation of the steam. It has been clearly shown by Mr. Rateau's experiments that the whole of the water contained in the accumulator participates in the regenerative action.

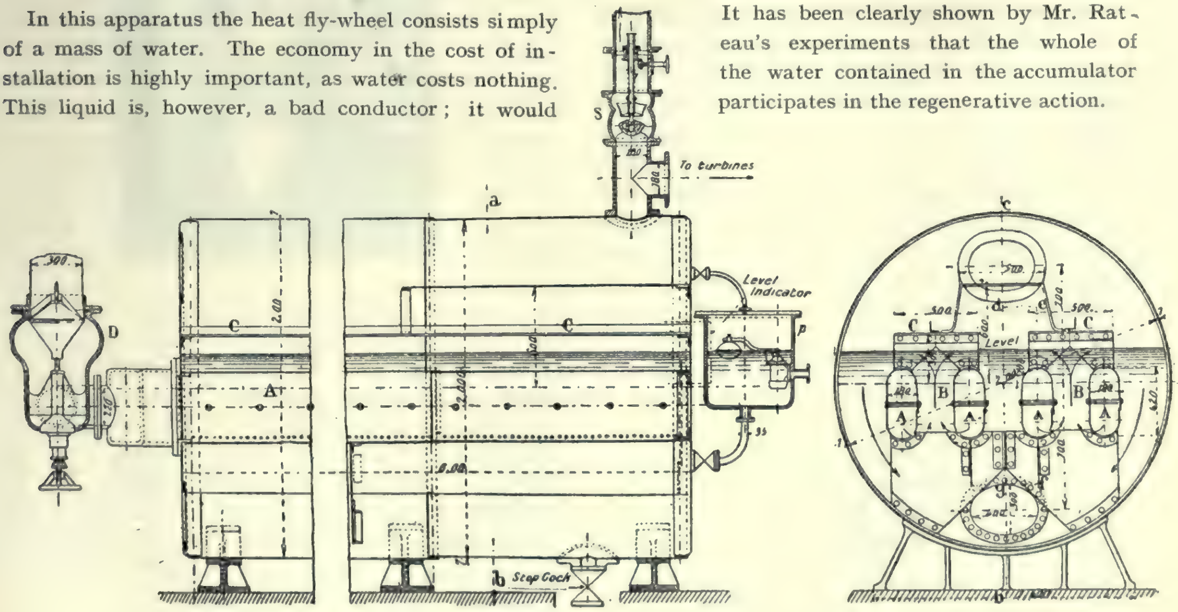


FIG. 2. LONGITUDINAL AND TRANSVERSE SECTIONS OF THE WATER ACCUMULATOR.

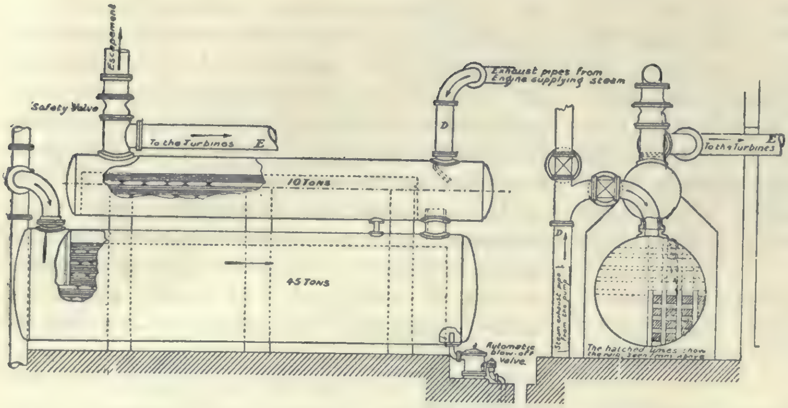

Escapement
Safety Valve
To the Turbines
E
Exhaust pipes from Engine supplying steam
D
10 Tons
45 Tons
Automatic blow-off valve
Steam exhaust pipe from the pump
D
To the Turbines
E
The hatched lines show the ... seen from above

FIG. 3. TRANSVERSE SECTION OF THE "SCRAP-IRON" ACCUMULATOR.

Besides these two fundamental types of accumulators, there exists a third, which can be utilised under certain special circumstances. It is shown in fig. 3, which represents the "scrap-iron" accumulator, Any cylindrical vessel, *e.g.*, an old boiler shell, can be utilised, and filled with old iron, scrap, old rails, etc. The advantage derived from the heat fly-wheel action of the water contanied in the tubes of the compound accumulator, is not obtainable by this apparatus, but if the necessary materials are at hand, a cheap accumulator is obtained in this manner.

The system has already been put into operation at the Réunion Collieries of the Madrid-Saragossa-Alicante Railway Company in Spain.

ACCESSORY APPLIANCES OF THE ACCUMULATOR.

The installation of an accumulator entails the provision of a certain number of accessory appliances amongst which may be mentioned the open-air escape, valve. This valve allows of the free discharge, either into the atmosphere or into a condenser, of the exhaust steam from the source of supply, when this is not required by the low-pressure machine, either because the latter is working at slow speed, or because it is stopped altogether. For this purpose a double-seated valve is employed, in order to secure a large area of escapement with low leverage. The pressure of the steam is counterbalanced by a spring which acts directly upon the valve, and as this spring can be tightened at will, it is possible to regulate the pressure necessary for the escapement as required. An automatic supply valve is also furnished, so that when the demand for steam exceeds the supply available from the engine, it allows of the direct arrival of steam from the boilers. It may be observed that no inconvenience arises on drawing off steam from the boilers when the engine ceases to furnish exhaust steam; on the contrary, it serves to regulate the working of the boilers. At the same time, this steam is not utilised at its initial pressure, nor does it produce, in the secondary motor, the full effect which it is capable of developing. It will be seen later on how this disadvantage has been completely overcome. The accumulators are furnished, in addition to the two accessories, with a steam stop-valve, a water stop-valve, and an automatic blow-off valve.

LOW PRESSURE SECONDARY MACHINE.

The steady current of steam regulated by the accumulator goes to feed a low-pressure motor. This could, theoretically, be a piston machine, but the steam pressure being, on admission, not far removed from that of the atmosphere, such a machine would require cylinders of large dimensions, in which considerable condensation would take place, and the efficiency of such a motor would be very low. On the other hand, a low-pressure turbine yields its greater efficiency with low-pressure steam. For the utilisation of exhaust steam almost any turbine would be adaptable, but Mr. Rateau has studied the type more especially adapted to work with a supply of low-pressure steam.

(To be continued.)

MR. BENNETT H. BROUGH,

Secretary to the Iron and Steel Institute.

THE WEEK AMONG THE TECHNICAL SOCIETIES.

THE INSTITUTION OF MECHANICAL ENGINEERS.

AT the first monthly general meeting of the session held on Friday last, there was read and discussed a paper by Mr. R. M. Neilson, on "The Possibilities of Gas Turbines."

The author refers to the prophecy made that turbines actuated by hot gases, other than steam, will eventually come to the front as prime movers. The idea is not new, but on applying it there are considerable difficulties to be encountered, and the object of experimenters should be, not so much to get the maximum and minimum temperatures as high and low as possible, but to get the mean temperature at which heat is given and withdrawn from the gas as high and low as possible, and the lower temperature is the more important. Gas turbines the author groups under four cycles and gives examples of the working under these different heads. His conclusion is that if small gas turbines could be sold at a low price and if they required little attention and do not get out of order, they might be in great demand, even although the gas consumption per b.h.p. hour was high. A user will put up with this rather than employ a power plant which has a higher initial cost, or which requires more attention, or is more inconvenient. With the average user of a small engine, producing say 100 b.h.p. hours per week, a reduction of £10 in the initial cost is of more consequence than a reduction of 2 cubic feet per b.h.p. hour in gas consumption. The same user would no doubt be quite willing to allow an additional 5 cubit feet of gas per b.h.p. hour if he were saved trouble and anxiety and small expenses in the working of the engine.

To produce a gas turbine cheaply it would seem necessary to entirely avoid reciprocating parts and to be content with a low compression. It might be advisable in certain cases to reduce the compression at the expense of efficiency. A rotary pump could undertake the compression. In many cases the vibration of a reciprocating engine is extremely objectionable; and a motor that ran with practically no vibration would be popular even at a higher initial cost and more consumption of fuel. If a satisfactory turbine were obtainable, there is no doubt that motor-car builders would eagerly buy it and instal it on their motor-cars.

One might mention many other uses to which gas turbines could advantageously be put if they were obtainable as fairly efficient and reliable machines. In many factories and engineering works, electric motors fed by current from a central station are used to drive individual machines or groups of machines in order to save the losses and inconveniences produced by driving by belts or ropes. Gas-engines (reciprocating) have been used to a limited extent for the same purpose; but the foundations required by these and the vibration caused by them have prevented their extensive use. If a gas turbine were obtainable which could be set down anywhere like an electric motor it would serve splendidly for this purpose, and in order to displace electric driving it would only require to possess an efficiency greater than the efficiency of the central station engines multiplied by the efficiencies of dynamo, mains and motor. Suction gas-producers are coming into extensive use, and by their means gas-engines can take the place of steam-engines in places where they otherwise could not. Whatever objections there may be to the supply of gas to gas-engines from these suction producers, these objections should be less rather than greater with turbines than with reciprocating engines.

The power of a gas turbine could be effectively varied with an insignificant variation of speed by cutting out one or more of the nozzles or admission ports which admit the fluid to turbine buckets, or first set of buckets when several are employed in series, the fluid being passed through the acting ports or nozzles at a uniform pressure and with a uniform velocity. The following points dealing with the losses in pneumatic compression to high pressures require, however, to be determined by experiment: (*a*) with reciprocating compressors; (*b*) with rotary compressors; (*c*) with a combination of reciprocating and rotary compression. Other problems are the expansion of hot gases in divergent nozzles, and radiation losses and transference of heat from gases to metals, at high temperatures. It would immensely aid the solving of the gas-turbine problem if experiments were made on these points and the results published.

Mr. Davey, in opening the discussion, said that he had made experiments on the lines sketched out by Mr. Neilson, but they had only been on a small scale. The paper was, however, valuable as indicating the direction in which the possibilities of the problem lay. The first part of the problem was that of producing in a practical way the working fluid; then the temperature difficulty followed, and the mode of application to the turbine was the next step. In his laboratory experiments he had succeeded in getting fair work at a low pressure, but he did not use the working fluids to propel the turbine, but had taken the working fluid into a reciprocating engine. It was desired to know what loss would be due to compression, both from reciprocating and rotary pumps, and then came the difficulty of using high temperatures in the turbine itself. With regard to the divergent nozzle, there was hardly any practical opinion on the subject.

Professor Burstall said that while gas turbines might not be for the present generation, no doubt they would come. Perhaps Mr. Neilson was, however, a little optimistic. When it was borne in mind that the gas turbine had to compress the fluid, to ignite the fluid, and then to deal with the fluid, which was infinitely more troublesome than steam, the difficulties were clearly very great. The thing was to make a gas turbine which would do good work at the engine shaft. No turbine could ever work in the same way as the Otto Cycle Engine, and he did not think that any form of Parsons' turbine was possible for working with gas. In the reciprocating engine there was a rather difficult set of conditions to deal with. As to the possibility of using the divergent nozzle, the limiting conditions were against it. The whole thing was a matter of mechanical conditions, and the gist of the matter was an efficient compressor. That should be the focus of experiments.

Mr. Atkinson said that the author had done for the gas turbine what Mr. Dugald Clerk had done for the steam engine many years ago, but at present the gas turbine existed merely in theory.

Professor Smith was of opinion that the difficulty of using gas turbines upon motors was not with the engine itself, but with the weight and bulk of the vessels which had to be carried to hold the gas.

Mr. Neilson, the author of the paper, in his reply, said it by no means followed that an efficient rotary compressor could not be used, although turbine compressors were not successful at high temperatures. More experiments were necessary to clear up the different matters which had been touched upon. It would mean money, but the experience gained would be well worth the expenditure.

INSTITUTION OF MINING AND METALLURGY.

There was a very interesting discussion at the first meeting of the present session held on October 20th. The president, Mr. Hennen Jennings, occupied the chair. The following new members and associates have been admitted.

Members: E. G. Banks, New Zealand (Transfer); E. J. Laschinger, Transvaal; H. F. Olds, Rhodesia (Transfer); W. Norman-Bott, London. Associates: Allan Archer, Southampton (Transfer); E. C. Boighese, Hastings; James B. Ballantine, Richmond; Hadyn Bevan, Straits Settlements; E. W. Bonwick, London; W. H. Campbell, South Australia; R. S. Illingworth, Isle of Wight; E. P. Johnson, New South Wales; Juan C. Montero, Camborne; J. E. Lewis Tonkin, Carn Brea.

The three papers read, of which summaries were given in the last issue of PAGE'S WEEKLY, were on "The Cyaniding of Ore at El Oro, Mexico," dealing principally with the regrinding of sands, by Mr. Charles Butters and Mr. E. M. Hamilton; "The Finer Crushing of Banket Ore," by Mr. W. A. Caldecott and "Dry Crushing of Ores by the Edison Process," Messrs. Simpkin and Ballantine, with some notes on experiments in grinding gold quartz by Mr. W. Fischer Wilkinson.

The Chairman said that these three papers were, as the titles indicated, very nearly related to each other, all of them dealing with points in reference to the problem of obtaining a greater percentage of extraction from gold ores. In connection with the progress made in this direction the paper on the Edison process as applied to gold ores was very opportune. He thought that under the circumstances it would be well to discuss the papers as a whole.

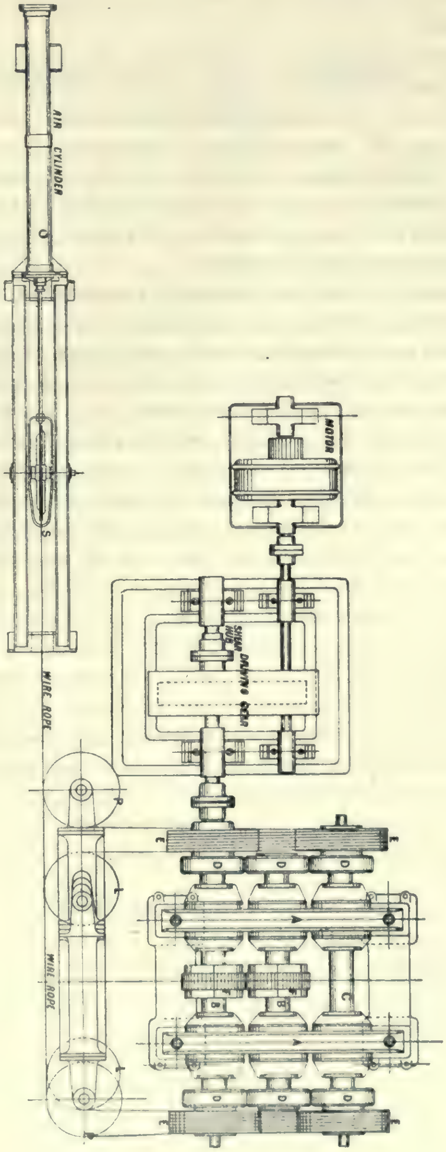
Mr. S. H. Pearce, the chairman of the Chemical Society at Johannesburg, who stated that he had just returned from a visit to the El Oro Mine, briefly summarised the heads of the paper by Messrs. Butters and Hamilton. He said the point it was desired to determine was to what extent the regrinding of gold ores was likely to be beneficial in assaying the extraction of the gold contents, and the value of a stamp battery and tube mill respectively.

Mr. S. Fischer Wilkinson, in summarising Mr. Caldecott's paper on the finer crushing of banket ore, said the result had been to increase the extraction from 90 to 95 per cent. at an increased expense of less than half the value of the additional gold won. With regard to the Edison process he had made a number of experiments with that process on gold ores, and he proposed to offer the results to the institution so that the figures might be put on record.

Mr. W. Simpkin, one of the authors of the paper on the Edison process, said the construction of the Rolls was entirely different to ordinary crushing rolls. None were at work in this country except the experimental plant at Richmond, where he would welcome members of the institution. The Edison process was primarily designed for crushing low-grade iron ore. The process was only suitable for dry crushing, and when banket ore was first dealt with, the slimes process had not reached its present high state of development, and the object then was to get a uniform product with as few slimes as possible. The process would, however, produce any quantity of slimes wanted.

Mr. Walter McDermott (past president), referred to the question of grading, about which a point had been made in the paper on the Edison process, but he noted that the wire used for the meshes of the screens was much finer than the standard, and it should be mentioned that small as might appear to be the difference in the thickness of the wire it increased the diameter of the holes in the screen by 50 per cent., and vitiated the comparisons with ordinary standard meshes. The question also arose as to what constituted slimes. The difficulty with regard to rolls had always been the matter of returns, and the rolls did less and less work as the stuff put through became finer. Their efficiency was a constantly diminishing ratio. In the Edison system a new principle had been applied, but he rather doubted if the tests as to increased efficiency would stand. With regard to the application of the system to gold ores, he would point out that with regard to the grading of ores Mr. Butters' and Mr. Caldecott's papers showed that the size of the mesh did not at all represent the mechanical condition of the ore, and in one case material crushed to pass 200 mesh would leach quite freely.

Mr. H. Livingstone Sulman had read what Mr. Butters had stated with regard to the tubular flint mill and wanted more information about the lining. With regard to the general question raised in the papers, he thought it was conclusively proved that there was an increased recovery due to fine grinding. The Rand was the latest convert to this belief. He looked upon telluride ores as being very suitable for such treatment. He thought it would be well to get the ore down to 150 mesh. He quite agreed that a new definition of slimes was wanted, although it was not news that fine mesh product was leachable. It was not only a question of fine grinding, however, but of preliminary battery crushing, and 30 or 40 mesh material was the best for the tube mill to do its work upon. Another point arising out of the papers was what should be done with the fine slime pulps produced, and some form of filtration was desirable which would permit the use of concentrated liquors to remove the dissolved gold. The filter press was too costly for low-grade pulp, and it was of interest to notice the strides made by vacuum filters as regards slimes. He looked upon the paper of



EDISON CRUSHING ROLLS.

Messrs. Butters and Hamilton as a model of what such a paper should be and likely to become one of the classics of the institution.

Herr Grusener gave some figures as to the working of Krupp mills in Western Australia. The working cost was 1s. 4d. to 1s. 5d. per ton. With regard to the liners, hard iron had been found the most suitable and preferable to chilled iron. The life of such a lining was about nine months. Steel plates would wear a little longer, but were not so suitable, the grinding on a steel surface being quite different to that on an iron surface. In South Africa it was thought a flint lining would give the best results.

Dr. Diehl said that the secret was to keep the mill well fed. On the subject of the filter press the cost with white labour had been brought down to 1s. 10d. per ton in Western Australia. The fact that telluride ores were suitable for fine grinding had been referred to and his experience went to confirm that view, a good extraction with those ores being obtained after fine crushing.

Mr. G. T. Holloway pointed out that owing to the method by which the extraction of gold had been arrived at, the results given in the papers of Messrs. Butters and Hamilton were probably slightly in excess of what the real figure would be in practice

Mr. Alfred James said that Mr. Butters used a very weak solution of cyanide when treating by agitation. Mr. Denny had obtained better results on the Rand by using a stronger solution. It also seemed probable that in some of his experiments Mr. Butters had been grinding his flints. With regard to liners, they had been told that a hard iron lining lasted nine months, but a manganese steel lining would last fifteen months. It was not true as suggested by Dr. Diehl that the linings had been badly handled on the Rand; they had been deliberately exerimenting in the matter. That was the explanation of the short life of the liners.

On the motion of the chairman the discussion stood adjourned until November 17th.

THE EDISON CRUSHING ROLLS.

The plant at Richmond consists of an 80-h.p. motor, running 600 revolutious per minute, the rolls being geared direct to the motor, and running 200 revolutions per minute.

Referring to illustration, one of the grinding rolls, marked F, and mounted on the shaft B, is coupled direct to the main gear shaft. The other roll F, on its shaft B, and the idler shaft C, are driven by friction alone.

When running empty, the grinding faces are about 1-16 in. apart, and the rolls are driven through friction on the spacers DDD.

The gearing, except those carrying the geared shaft, are free to slide in a frame formed by the bed plate and the top girders AA.

It should be mentioned that the main gear is attached to a shear device, arranged, in case of undue shock, to release the gearing and protect the machinery from injury.

When material is being passed through the rolls the opening increases. The spacers DD are relieved, and the outer grinding roll is driven through the material itself as it passes between the rolls.

Suitable grinding pressure is produced by the tension on a ¾-in. endless steel wire cable, wrapped continuously round the sheaves EE, LL, EE, PP, and S. The pressure upon the rolls is governed by that maintained in the air cylinder.

The plates on the rolls have ratchet-shaped corrugations which have the effect of biting the material and forcing it through the rolls.

MANCHESTER ASSOCIATION OF ENGINEERS.

At the meeting of this Association, held on Saturday last, Mr. C. James Wells submitted a valuable and interesting paper on "The Temperature-Entropy Diagram."

The science of "Thermo-Dynamics," as regards the steam engine, probably owes the deepest debt to the labours of Rankine and Clausius, since they not only laid the foundations, but raised the greater part of the superstructure. They employed very largely the analytical or mathematical methods, and, in consequence, the majority of writers followed the same course, and this is the great reason why engineers know so little, and care less, concerning the "thermodynamics" of text-books, preferring to learn what they need in their own way. It is not, as the author points out, that thermo-dynamics is hard to understand, the real difficulty lies in the language used for its expression.

Just as the indicator diagram shows graphically the variation of pressure in the steam engine, and the planimeter sums up or integrates the curves obtained, the temperature-entropy diagram reduces the work where calculations have to be made concerning the flow of heat into or from the working medium. The possibility of such a method was hinted at by William Gibbs in 1873, but the full solution of the problem is due to Mr. MacFarlane Gray, the late Mr. Peter Willans, and Captain H. R. Sankey. The author discusses the question very fully. He arrives at the conclusion that, in order to construct a theta-phi diagram an accurate test of the engine must be made so that (1) a good mean indicator diagram is available; (2) the exact volume of the clearance spaces must be ascertained; (3) the exact diameter of the cylinder and length of stroke must be found; and (4) the exact weight of steam and water passing through the cylinder must be known.

BIRMINGHAM ASSOCIATION OF MECHANICAL ENGINEERS.

At the meeting of this Association, held on October 20th, a paper was read by Mr. W. H. Thornbery, on "Wheel Gearing," an old subject, but one of perennial interest. All engineers wish to obtain the maximum of power at the minimum of cost. For a long time after the introduction of steam power for cotton and woollen mills, the use of toothed gearing was universal. For many purposes, however, belt or ropes have many advantages over toothed gearing, although in rolling mills, for iron, steel, brass and other metals, toothed wheels are and will be largely used, and in machinery where power has to be transmitted only in small amounts and where regularity and exactitude of motion are of the utmost importance, toothed wheels of various kinds are, and will be, absolutely necessary, except where the modification of chain driving is employed. And, moreover, with toothed-wheel work there is less loss of power in transmission than by other means of power transmission. Toothed wheels are used for such purposes as, to transmit motion from one revolving shaft to another; to transmit power from one revolving shaft to another; to change the velocity ratio of two revolving shafts; to alter the direction of motion.

The paper, which was illustrated by lantern slides, went to that show wheel-gearing only needed to be properly applied to give excellent results. The method of forming the acting surfaces of the teeth is important to ensure proper working as far as the velocity ratio is concerned. The length of the teeth must be such that the proper number of them are always in gear so that the driving is continuous, and theoretically cycloided teeth only work with perfect exactness when the pitch circles of the wheels rigorously touch each other. To obtain the greatest possibility, uniformity of wear, the number of teeth of two wheels geared together should be "prime" to each other. Pitch may be measured in two ways, either by "arc pitch," or "chord pitch." The dimetrical system of pitch is sometimes used for large gearing and is generally employed for small gear wheels. The breadth or "face" is usually three times the pitch. Helical gearing is also referred to by the author. By far the larger number and weight of toothed gearing in use at present is made of cast iron. The conclusions arrived at by the author are that toothed gearing properly applied tends to lengthen the life of machinery, with a considerable saving, not only of capital but of labour.

The reading of the paper produced an interesting discussion.

INSTITUTE OF MARINE ENGINEERS.

The "Question of Technical Education" is bound up with the struggle for industrial supremacy, and Mr. James Adamson, the hon. secretary of this Institute, has done good service in submitting a well written and closely reasoned paper to a meeting held on Monday last. The discussion of such a subject involves so much and raises so many issues, that it is difficult to set down a fixed policy and standard defining what portion of time should be devoted to practical training, and what to the theoretical education; also how these can be dovetailed into one another to get the best out of the combination.

As to what should be studied that is another problem. It is treason, as Professor Rayleigh has said, to judge of knowledge by its immediate practical application; the latter being, in truth, the unearned increment that comes to knowledge pursued for its own sake.

The advantages to be derived from technical education, from the national point of view, are that after a good general education a secondary specific education should better equip the nation as a whole for holding its own with other nations in respect to trade and commerce. If it does not do so it falls short of its intention and shows there is something wrong with the system.

For the engineer, the transmission of heat, the chemical composition of boiler water, the calorific value of fuels, the constituents of combustion and the combining properties to give perfect combustion, the best system of treatment for boilers, are details of which the theories at least can be taught in the class-room. There are many details, on the other hand, which experience can alone teach, and experience is of more importance, taken alone, than the cramming process of imparting technical education, by which a young and often foolish engineer imagines that a knowledge of the coefficient of friction or the analysis of sea water is the royal road to distinction. Technical education should be real education. As a mental training, education should not tend to turn out students as a baker turns out penny pies, but should train and develop in different directions those who differ in temperament, by allowing the individuality of the student ample scope. It ought to be designed and developed in order to place us as a nation in the best possible position to enable us to compete successfully with other nations, not only in respect to the manufacture of large and small appliances, but as to the best means of placing our manufactured articles on the markets of the world. Technical education has been upheld as one great cure for our weakness in many forms of competition, and doubtless it will help in some respects if rightly applied, but it is not so much the education as the application of it to the wants and requirements of the day which will prove to be the remedy.

York Institute.

Sir Edward Grey, M.P., in the presence of Lord Armstrong, Sir James Joicey, M.P., Sir Lindsay Wood, Mr. J. L. Wharton, M.P., and other directors of the North-Eastern Railway Company, opened a few days since the new physical and engineering laboratory of the York Railway Institute. Sir Edward Grey said he was convinced that no country was more qualified by nature and brains to make use of good scientific training than our own, and, therefore, there was all the more reason why there should be good opportunities of acquiring it. In commerce we were not content with raw material, but worked it up into the finished article, and so with human beings, which were raw material, we should work them up into the highly finished article of scientifically trained intellects. In the great struggle for success everything depended on the use which we made of scientific discoveries.

Faraday Society.

An ordinary meeting was held on Tuesday, in the library of the Institution of Electrical Engineers, 92, Victoria Street, S.W., when the following papers were on the agenda: "Note on a suggested new source of Aluminium," by Buena Pool, B,Sc, "The Measurement of the Potential of the Electrodes in Stationary Liquids: The Determination of Changes of Concentration at the Cathode during Electrolysis," illustrated, by Henry J. S. Sand, Ph.D., M.Sc· "Electrolytic Oxidations of Hydrocarbons of the Benzene Series. Part I.: Hydrocarbons containing the Methyl Group," by H. D. Law and F. M. Perkin.

Electrical Notes.

Winding-Coils for Extra High-Tension.

In extra high-tension coils for transformers it is a little difficult to prevent the coils developing a short circuit internally due to a difference of potential between adjacent wires. One way of minimising the risk is to divide the high-tension winding into a number of small coils each having many layers and but a few turns to each layer. Another is to wind each layer the same direction and at the end of each layer to carry the wire back across the face of the coil to the starting side. In this way the difference of potential between successive layers is much reduced. At the end, where the small sectional coils project beyond the core, they may with advantage be spread out so as to give increased air insulation space and this at the same time facilitates ventilation.

Linolite.

With the aid of electricity, shop-window lighting has now become quite an art. The ideal method is to throw a brilliant light on to the goods, whilst at the same time screening it as far as possible from the eyes of the public. Among the more recent developments in this direction is the introduction of Linolite, which consists of a number of long vacuum tubes enclosed in semi-circular channel of highly polished aluminium. Instead of the filaments in the lamps being coiled, as in an ordinary glow lamp, they are carried from end to end of the tube, the terminals and holders being at each end, a small loop midway in the length provides for expansion.

One great advantage of this method of lighting shop-windows is that the *space occupied* is so small, the over-all width of the metal channel being only 2½ in., and the depth 1¼ in. The weight is about ½ lb. of per foot run, and consequently it can be fixed in places where other illuminating devices are not convenient.

The edges of the semi-circular aluminium channel are beaded over, and each of these beads carries one of the electric wires. For 110-volt circuits short branches are led off to each of the holders as for ordinary glow lamps, but for 200-volt circuits the lamps are arranged two in series.

The third annual dinner of the Glasgow local section of the Institute of Electrical Engineers is being held to-night (Friday).

The meetings of the Institution of Civil Engineers will be resumed on 1st November, when the president, Sir Guildford L. Molesworth, K.C.I.E., will deliver an inaugural address.

British Standard Bull-Headed Railway Rails.

We have just received from Mr. Leslie S. Robertson, M.Inst. C.E. (Secretary), a copy of the latest report issued by the Engineering Standards Committee, comprising British Standard Specification and Sections of Bull-Headed Railway Rails.

At the commencement of their labours the sub-committee, through the courtesy of the principal railways of the United Kingdom, were enabled to obtain particulars showing the trend of modern practice with regard to the sections of bull-headed rails then in use. From these data several series of drawings of the sections were prepared and circulated to the chief engineers of the principal railways of Great Britain and Ireland, and as a result the present standards were arrived at.

A similar course was adopted with regard to the draft specification for bull-headed rails, which was also submitted to the chief engineers of the principal British and Irish railways, through the Railway Engineers' Association, and to a meeting of the leading rail-makers.

The thanks of the committee are due to the members of the Railway Engineers' Association for their cooperation, and in particular to Mr. James C. Inglis, for the preparation of the various series of standard bull-headed rails.

The sub-committee who were entrusted with the drafting of the standard specification and sections of bull-headed railway rails were as follows:—

James C. Inglis, Esq., chairman; F. R. Upcott, Esq., C.S.I., representing the India Office; G. L. Eyles, Esq., C.M.G., representing the Crown Agents for the Colonies; J. Wilson, Esq. (G.E.R.), and W. B. Worthington, Esq. (L. & Y. R.), nominated by the Railway Engineers' Association; J. A. F. Aspinall, Esq. (L. & Y.R.); W. Evans, Esq; Brodie Henderson, Esq.; E. Windsor Richards, Esq.; A. Ross, Esq. (G.N.R.); E. B. Thornhill, Esq. (L. & N.W.R.); J. M. While, Esq.

The chairman of the committee on rails (consisting of more than twenty members) is Sir John Wolfe Barry, K.C.B.

The following are extracts from the specification:—

The steel for the rails shall be of the best quality, made by the Bessemer, Siemens-Martin or other process, to be approved by the engineer (or by the purchaser).

The rails shall show an analysis that in chemical composition they conform to the following limits:—

Carbon ..	from ..	0·35 to 0·5	per cent.
Manganese	,, ..	·7 to 1·0	,,
Silicon ..	not to exceed ..	0·1	,,
Phosphorus	,, ..	0·075	,,
Sulphur ..	,, ..	0·08	,,

Each rail shall be made from an ingot not less than 12 in. square at the smaller and 14 in. square at the larger end, and must be cogged down into blooms, and sufficient crop then sheared from each end to ensure soundness.

A rolling margin of ½ per cent. under to ½ per cent. above the specified weight will be permitted, but the contract weight only will be paid for.

Table of General Dimensions of "B.S." Rails.

No. of "B.S." Section.	Height of Rail.	Width of Head.	Nominal Weight of Rail.
	Inches.	Inches.	Lbs. per Yard.
60	$4\frac{3}{4}$	$2\frac{5}{16}$	60
65	$4\frac{7}{8}$	$2\frac{3}{8}$	65
70	5	$2\frac{7}{16}$	70
75	$5\frac{1}{8}$	$2\frac{1}{2}$	75
80	$5\frac{3}{8}$	$2\frac{9}{16}$	80
85	$5\frac{15}{32}$	$2\frac{11}{16}$	85
90	$5\frac{35}{64}$	$2\frac{3}{4}$	90
95	$5\frac{23}{32}$	$2\frac{3}{4}$	95
100	$5\frac{29}{32}$	$2\frac{3}{4}$	100

The committee recommend the adoption of the following as the normal lengths of rails—viz., 30 ft., 36 ft., 45 ft., or 60 ft.

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Full details of the tests to be imposed are included in the specification.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Shipbuilding, Iron and Steel, Mining and Allied Trades.

DAVIDGE PAGE, Editor.

Club House, Surrey Street, Strand, London, W.C.
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Editorial.—*All communications intended for publication should be written on one side of the paper only, and addressed to "The Editor."*

Any contributions offered, as likely to interest either home or foreign readers, dealing with the industries covered by the Weekly, should be accompanied by stamped and addressed envelope for the return of the MSS. if rejected. When payment is desired this fact should be stated, and the full name and address of the writer should appear on the MSS.

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New Copy for Advertisements,

Alterations, &c., intended for insertion in the current week's issue must be delivered **not later than 4 p.m. on Monday.** If proofs are required the copy and blocks should reach us several days earlier.

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OFFICIAL NEWS RECORD.

Appointments.

Mr. Alfred Slater has resigned the office of general manager of the Gloucester Railway Carriage and Wagon Company, Ltd., Gloucester, because of ill-health. The directors have appointed Mr. John W. Howard, who has been assistant manager for many years to succeed him.

Mr. Thomas M. Batchen, C.E., formerly principal assistant Highland Railway, has been appointed engineer to H.M. Board of Works of Ireland. Mr. Batchen has latterly been acting as engineer of light railways in the North of Ireland.

Appointments Filled.

Mr. Ernest Mellor has been appointed to the position of civil engineer under the municipality of Singapore.

Mr. J. A. G. Harrison has secured the appointment of engineer to the Potchefstroom (Transvaal) Town Council.

Captain Owen, assistant superintendent at Deptford Market, is recommended for appointment as manager of the London County Council's fleet of river steamers.

Mr. John Barker, jun., assistant engineer and manager at the Greenock Corporation gasworks, has been appointed engineer and manager to the Nairn Gas Light Company.

Mr. F. T. Callis, senior engineer-in-charge at the Sheffield Corporation electric light station, is about to take up an appointment with Messrs. C. A. Parsons and Co., of Newcastle-on-Tyne.

Mr. Clifford Womersley, chief inspector of the Huddersfield Corporation tramways, has been appointed, out of fifty-eight applicants, to the post of tramways traffic superintendent at Kilmarnock.

Mr. Humphrey Jones has been elected to succeed his father, Mr. D. Jones, who died recently, in the management of the Portmadoc District Council's gas-works. There were seventy-eight applicants for the post.

Obituary.

The death is announced of Mr. Joseph Senior, of the firm of Messrs. J. and J. E. Senior, ironfounders and engineers, Bury.

Mr. James Wison Brockbank, chairman of the Whitehaven Hematite Iron and Steel Company, died a few days ago.

Mr. Leonard Brierly, J.P., whose death at Edgbaston was announced a few days since, had been prominently associated with several large industrial undertakings. His early business life was passed in the service of Messrs. Ralph Heaton and Sons, of the Birmingham Mint, and he afterwards became manager of the mint at Marseilles. Among the industrial undertakings which absorbed the energies of his later years outside the Essington Works were the Patent Shaft and Axle-tree Company, Ltd., of which he was chairman, and the Midland Railway Carriage and Wagon Company, of which he had also been the chairman.

Mr. W. James, late chief constructor at Chatham Dockyard, has died at the early age of fifty-six. He was associated with the construction of some of the largest battleships in the Navy.

Partnerships Dissolved.

J. E. Wedekind and T. Miller, electricians, etc., Clerkenwell Road, E.C., under the style of Charles Peacock and Co.

M. S. Napier and C. Jarrott, motor-car dealers, Marlborough Street, W., under the style of Charles Jarrott.

F. W. Barker and A. S. Aspey, engineers, etc., Hull, under the style of Barker and Aspey.

J. W. Sykes and E. I. Sykes, iron and brass founders, Guiseley, near Leeds, under the style of J. W. Sykes.

J. Richardson and G. B. Hartley, civil engineers and surveyors, Leeds, under the style of Richardson and Hartley.

C. Koch and R. L. Reed, incandescent mantle manufacturers, Altona, Germany and Manchester, under the style of Koch and Reed.

Company Reports and Meetings.

The West African Telegraph Company has declared an interim dividend at the rate of 4 per cent. per annum for the six months ended June 30th.

The Oriental Telephone Company has declared interim dividends of 3 per cent. on the 6 per c nt. cumulative preference shares and on the ordinary shares.

The Globe Telegraph and Trust Company has declared a quarterly interim dividend of 3s. per share on the preference and of 2s. per share on the ordinary shares.

Callenders Cable and Construction Company have declared an interim dividend of 5s. per share on the ordinary shares. Sir J. Fortescue Flannery, M.P., has been elected a director of the Company.

The annual meeting of Baldwin's, Ltd., was held at Birmingham, on Friday last. Mr. Alfred Baldwin, the chairman, said that the gross profit was £40,000 less than last year, which was due to the fact that the price of tin bars, of which the Company had an output of 150,000 tons per annum, had borne no relation to the cost of manufacture. The German and American competition had been the severest yet experienced in the trade, and had the Company elected to depend wholly upon foreign steel for the supply of their finished products, there would have been considerable financial benefit to the Company. That, however, would have necessitated the discharge of 1,000 workmen. As to the future, the outlook was satisfactory, the only black spot being the tin bar trade. The report was adopted.

The report of the directors of Tubes, Ltd., for the year ended October 1st, shows a net trading profit of £4,835 to carry to revenue account, which compares with a similar profit of £4,993 for the previous year. The fall in prices referred to in the last two years' reports has continued during the whole of the period under review. and the directors cannot at present hold out to the shareholders any hopes of improvement in this direction, current prices being even lower than at any time in the company's history. The directors have been unable to dispose of either the Credenda or St. Helen's Works.

The Electrolytic Alkali Company's accounts show a credit balance of £1,374, which the directors recommend should be carried forward.

The Western Telegraph Company announce a final dividend of 3s. per share, making 6 per cent. for the year ended June 30th.

The report of Brampton Brothers, Ltd., shows a net profit of £5,621, and it is proposed to pay a dividend on the ordinary shares of 2½ per cent.

The South London Electric Supply Corporation reports have sold during the first nine months of the current year 6,590,572 units, as against 2,788,400 units for the corresponding period of last year, showing a gross revenue of £51,009, as against £27,065.

Flemming and Furguson, Ltd., recommend a dividend on the ordinary shares of 5 per cent., which, with the interim dividend of 5 per cent. paid on April 1st last, makes 10 per cent. for the year.

The report of the Wilson and Clyde Coal Company, Ltd., for the year ending August 31st last, recommends a final dividend on the ordinary shares of 7s. per share, making 20 per cent. for the year, comparing with 25 per cent. for the previous year. The report refers to the languishing condition of the foreign and home markets for coal during the period covered by the report.

An extraordinary general meeting of the Daimler Motor Company, Ltd., was held on Monday, for the purpose of considering a conditional agreement with Mr. Ernest M. C. Instone, on behalf of an intended new company, for the sale of the company's undertaking. Sir E. Jenkinson stated that during the past year the company's sales were a little more than in the previous year, and that the company had half as much more work on hand for customers and stock than at the same date in 1903, while they were well forward with new types for 1905. There had been greater economy in manufacturing, and the company was now turning out cars second to none, whether English or foreign made. Competition was still very severe, but imports were inclined to slacken off. Nevertheless, during the first eight months of this year the cars imported into this country numbered 4,262, of a value exceeding £1,596,000. It was lamentable to see such a demand for foreign cars when cars of English make could be purchased superior to any that were made abroad. With regard to the scheme, he explained that the board had provisionally sold the undertaking to a new company with the same name. The value of the shares was to be reduced from £1 to 12s. 6d. each, thereby enabling the item- of licences goodwill, etc., to be written down considerably. All, the liabilities of the present company, and also the debentures, would be taken over by the new company. With the proposed increased capital in the new company of £75,000, he estimated that sufficient profits would be made to meet not only the debenture interest, but a dividend of 6 per cent. on the preference and ordinary shares, and still leave a surplus available for a further distribution. He did not say that that result would be secured in the first year, but he believed that it would be in the near future. The resolution was carried.

Launches.

The first class cruiser *Black Prince* will be launched from the yard of the Thames Ironworks Shipbuilding and Engineering Company, Ltd., on the 8th prox.

The first-class battle-ship *Britannia* will probably be launched on December 8th, at Portsmouth.

Statistics compiled show that during September Scotch shipbuilders launched 31 vessels, of about 44,612 tons gross, as compared with 25 vessels, of 31,913 tons gross, in September last year, and 33 vessels, of 57,862 tons gross, in September, 1902. In the nine months Scotch builders have launched 242 vessels, aggregating 316,909 tons gross, as compared with about 331,254 tons gross in the corresponding period of last year. English shipbuilders in September put into the water 34 vessels, of about 87,226 tons gross, against 22 vessels, of 51,782 tons gross, in August; 27 vessels, of 60,733 tons gross, in September last year, and 27 vessels, of 60,427 tons gross, in September, 1902. For the nine months English builders have launched 233 vessels, of 545,375 tons gross, as compared with 223 vessels, of 479,623 ton gross, in the corresponding period of last year.

The steamship *Caledonia*, intended for the Glasgow and New York service of the Anchor Line, was launched on Saturday last, by Messrs. D. and W. Henderson, Meadowside, Glasgow. The launch is an interesting one, inasmuch as the *Caledonia* is the largest vessel ever built for the Clyde transatlantic trade. Her tonnage is 16,000 tons, length 515 ft., and breadth 58 ft. Her engines will develop 30,000 h.p., and she will carry 1,500 passengers. She is divided into nine water-tight compartments.

The "Armée et Marina" states that the French submarine *Alose*, built at the Mourillon Arsenal, was launched on the 12th inst., being the last of ten submarines designed for the mobile defences of Corsica, Algeria, and Tunis. The dimensions of the new boat are: length 78·74 ft., beam 7·54 ft., displacement 68 tons. The motive power is entirely electrical, and the boat has a speed of eight knots.

The *Dora*, a boat specially fitted for the emigrant-carrying trade, has just been launched by Messrs. Russell ad Co, Port Glasgow. She has been built to the order of Messrs. Fratelli Cosulich, Trieste. The dimensions of the steamer are: Length, 295 ft.; breadth, 40 ft. 4 in; depth (moulded), 20 ft. Her cylinders are 24 in., 40 in., 65 in. by 42 in. stroke.

Tenders Accepted.

The tender of Messrs. Pauling Bros., of Johannesburg, has been accepted for the work in connection with the Bloem Spruit improvement, Bloemfontein, referred to in the September issue of PAGE'S MAGAZINE. The amount of the tender was £54,267.

Messrs. R. Stephenson and Co., Darlington, have received an order for ten goods locomotives and tenders from the Bengal-Nagpur Railway.

Messrs. Alley and MacLellan have just received an order to supply two of their "Sentinel" patent compound intercooling air-compressors for Messrs. William Beardmore and Co.'s (Ltd.) new shipyard at Dalmuir. These machines are of size No. 8 double, having a total capacity of 5,500 cubic feet per minute at standard speed. The compressors will each supply air at 30 lb. and 100 lb. per square inch, the return for the 100 lb. service being led to the 30 lb. reservoirs, and the air supply will be automatically controlled by governors at both these pressures.

Messrs. Hudswell, Clarke and Co., Ltd., of Leeds, inform us that they have just received an order from the Barry Railway Company for six large main line locomotives.

Messrs. Ernest Scott and Mountain, Ltd., of the

Close-works, Newcastle-on-Tyne, have recently secured contracts to supply an electric fan and an endless rope haulage gear, a main shaft pump of the three-throw type, and several other pumps for the Dunston, Swalwell, and Garesfield Collieries, Limited, for Messrs. James Ross and Co., of the Philipstown Oil Works, Linlithgow.

We are informed that Messrs. T. Sugden, Ltd., have secured an order to instal fourteen of their superheaters in connection with Lancashire boilers for the City of Birmingham Electricity Works.

Messrs. Foster Bros., Ltd., of Lea Brook Works, Wednesbury, have secured the contract for the wrought steel high-pressure steam pipe work for the Storfoshei and Guldsmedvik power houses of the Dunderland Iron Ore Company, Ltd.

The contracts for the steel work in connection with the warehouses and stores for the North British Railway at College Station, Glasgow, has been given out, the principal contractors being Messrs. Robert McAlpine and Sons, who have sublet orders for the structural steel amounting to over 8,000 tons.

Contracts Open.

Limerick.—For a steel Lancashire steam boiler, 7 ft. diameter by 27 ft. long, having flues 2 ft. 9 in. diameter, and made to best specification, to carry a working pressure of 100 lb. per square inch, and subject to inspection of the Manchester Steam Users' Association, for the Limerick District Lunatic Asylum. —November 7th.

Burslem, Staffs.—For the supply and erection of electric plant at the Workhouse, Chell, for the guardians of Wolstanton and Burslem Union.—November 15th.

Frinton-on-Sea (Essex).—For construction of about 1,600 yards lineal of concrete and masonry sea-walling, sloping and draining cliffs and greensward, forming promenade, and other works, for the Frinton-on-Sea Urban District Council.—November 7th.

Wickford (Essex).—For providing and laying about three miles of 4 in., 3 in., and 2 in. cast-iron water-mains in the parish of Wickford, for the Billericay Rural District Council. Specifications and bill of quantities can be obtained from the engineers, Messrs. Merryweather and Sons, Ltd., Greenwich-road, S.E., where plan can be inspected upon payment of £1 1s., which sum will be returned upon receipt of a bona fide tender.—October 31st.

Wakefield.—For the supply of coal (slack and smudge) required, at the electricity works of the Corporation of Wakefield, at Calder Vale, in the city of Wakefield, during year ending December 31st, 1905.—November 8th.

London.—Coal.—For supply in Bombay of 10,000 tons best South Wales steam coal of the following varieties, for the Bombay, Baroda, and Central India Railway Company:—viz., Ferndale, Nixon's Navigation, Albion, and /or Powell Duffryn. The coal is to be shipped under inspection on behalf of the Company. Particulars of the Secretary, Gloucester-house, Bishopsgate-street without, E.C.—November 3rd.

The Marine Motor Association.

The autumn general meeting of this Association takes place shortly, when, among other matters, it is expected that an important discussion will take place on the measurement of motor yachts and launches for racing ratings.

Although founded so recently as 1902, this body has already done much good work in fostering the sport of marine motor racing, and indirectly the marine motor industry. It is a legislative body, having the same relation to marine motoring as the Y.R.A. has to yacht racing. Its object being to regulate and govern the sport, it is not too much to say that this object has been fully attained, and this is particularly true of the working of its Measurement Rules, to which practically all the motor boats built during the last two years have been designed. In view of the fact that it is only within the time mentioned that the installation of very high engine powers in small and light craft has become possible, the satisfactory results of the previously untried M.M.A. rating rule are all the more remarkable. One has only to compare the shipshape and seaworthy types of motor craft produced for this year's racing with the "freak" designs with which the yachting papers were filled two years ago to realise this fully.

The membership of the Marine Motor Association, which maintains a healthy rate of increase as time goes on, includes practically every name having weight in the marine motor world. The body is governed by a president, which office is ably held by Major F. Lindsay-Lloyd, R.E., two vice-presidents, Capt. R. T. Dixon, R.E., and Mr. H. G. A. Rouse, M.I.C.E., and a council of twenty gentlemen, all of whom are well-known in yachting and motoring circles. Mr. Linton Hope, A.I.N.A., who was largely instrumental in the foundation of the Association, is hon. secretary, and Mr. James A. Smith, M.I.N.A., of 47, Leadenhall-street, E.C., a naval architect who has made a special study of marine motor work, acts as secretary and official measurer.

NEW PUBLICATIONS.

"GOLD ASSAYING."

A practical Handbook giving the modus operandi for the accurate Assay of Auriferous Ores and Bullion, and the Chemical Tests required in the Processes of Extraction by Amalgamation, Cyanidation and Chlorination, with an appendix of tables and statistics. By H. Joshua Phillips, F.I.C., F.C.S., A.I.C.E. Crosby Lockwood and Son.

The exploitation and development of gold bearing deposits in various parts of the world has during recent years greatly increased the number of those interested in gold mining, metallurgy, and assaying, and to these, the author of "Engineering Chemistry" has rendered a considerable service. The general scope of the present work may be summed up as follows: The natural occurrence and forms of gold; its physical characters and chemical properties; sampling of gold ore; fusion; cupellation; scorification; assay of bullion, etc.

"THE ELECTRICAL INDUSTRY."

Lighting Traction and Power. By Adam Gowans Whyte, B.Sc. Methuen and Co. 2s. 6d. net.

Commencing with the origin of the electrical industry, the author of this very readable volume gives a succinct account of its rise and progress, dealing successively with the early days of electric traction, the development of electric inter-urban tramways, electric railways, etc. An interesting chapter is devoted to "Electrical Engineering as a Career," attention being paid to those institutions and firms which endeavour to give an ideal training by the combination of theoretical, technical and practical instruction. Other sections of the book deal with the economies of electric power and electric power distribution schemes. The present chaotic and illiberal state of the law relating to electrical matter, does not prevent the author from adopting a decidedly optimistic view of the future of the electrical industry.

"THE STORY OF THE ATLANTIC CABLE."

By Charles Bright, F.R.S.E. George Newnes, Ltd. 1s.

This is an entertaining sketch of the gradual evolution of submarine telegraphy and of the difficulties experienced in laying the Atlantic Cable.

CATALOGUES.

The Simplex Steel Conduit Company, Ltd., send us an effective glazed wall chart, illustrating with a selection of their fittings, joints, connections, etc.

From the Sturtevant Engineering Company, Ltd., we have received a substantial volume entitled "Mechanical Draft," a Practical Treatise, edited by Walter B. Snow, of the engineering staff of the B. F. Sturtevant Company. The subject has received a comprehensive treatment and will be read with great interest by engineers who are called upon to decide the question of chimney v. fan.

To Messrs James Simpson and Co, Ltd., of 101, Grosvenor Road, S.W., we are indebted for a very handsome descriptive booklet on the Coolgardie Water Supply scheme, a subject which has already been dealt with at some length in this Journal. The full page plates are exceptionally well produced and the value of the booklet is much enhanced by the number of line diagrams.

Openings for Trade Abroad.

United States of America.

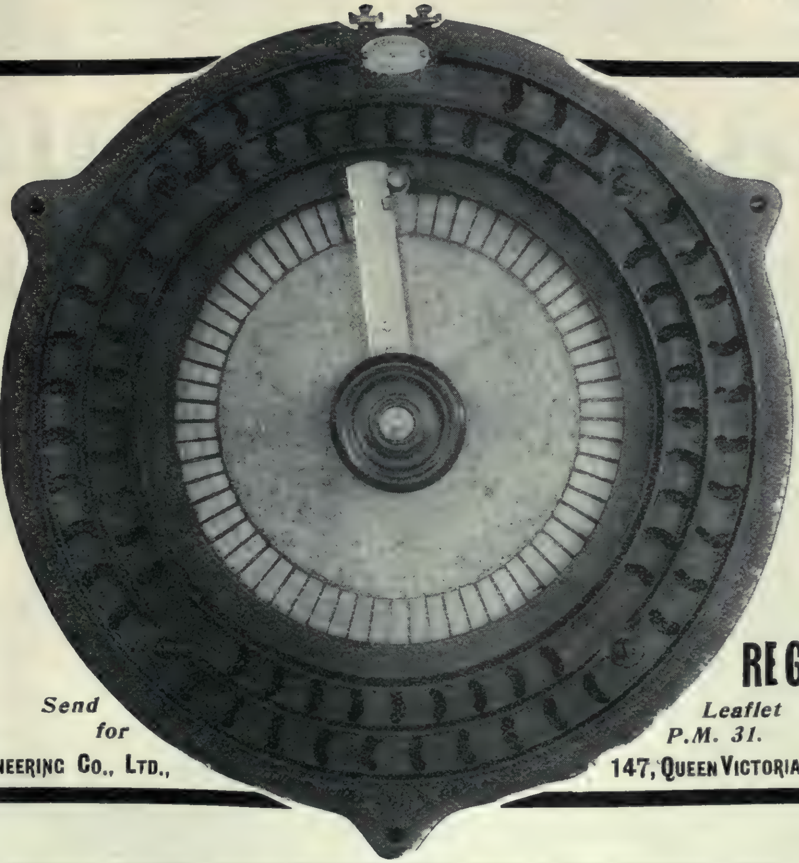
The Louisiana State Legislature recently passed an Act authorising the issue of bonds by the Board of Commissioners of the Port of New Orleans to the amount of $2,000,000, the proceeds of which are to be applied to the improvement of the facilities of the port. The work will involve the following items of construction: Five miles of wharves with creosoted materials; five miles of steel sheds; five miles of durable roadway, with approaches at all street intersections; pavement beneath all sheds; five miles of water mains along the river front, with hydrants at frequent intervals; pumping station, probably electrical; large hydraulic dredge boat; fire boat, and numberless sundries of smaller importance.

Belgium.

The *Societe Nationale des Chemins de Fer Vicinaux* require tenders for the construction of that portion of the Hasselt-Herck-la-Ville-Haelen Railway situated between Herck-la-Ville and Haelen. A deposit of £280 is necessary to qualify any tender. The estimated cost of the work is about £2,960.

Argentina.

Senor J. Lloyd has obtained to right to construct a line of railway from the terminus of the railway already authorised in the province of San Luis to San Rafael, in the province of Mendoza, and thence by the valley of the Atuel to a point on the frontier between Chile and Argentina.



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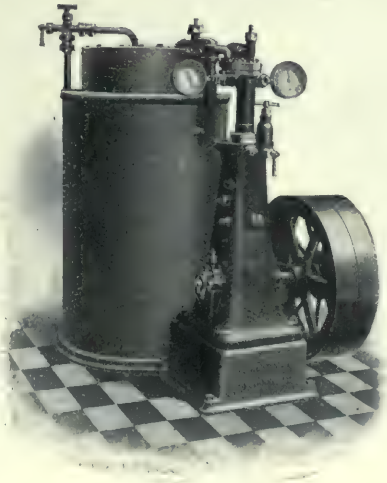

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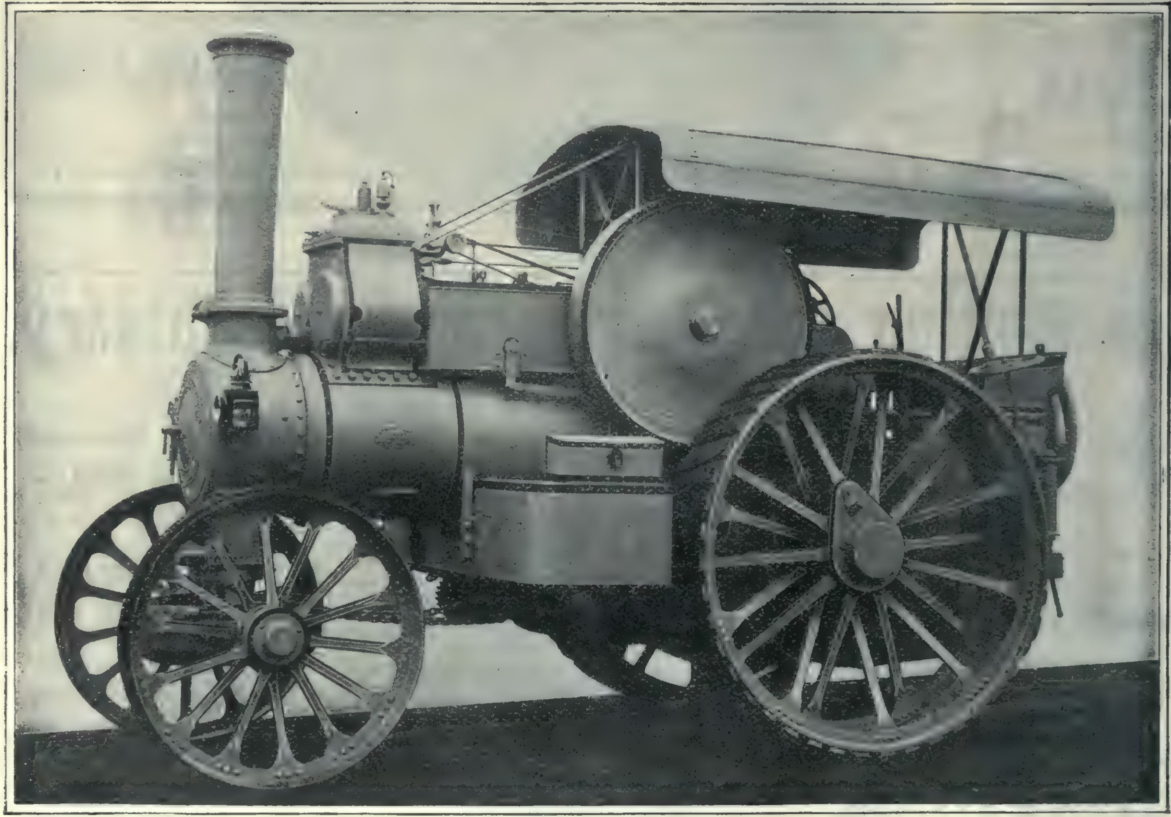

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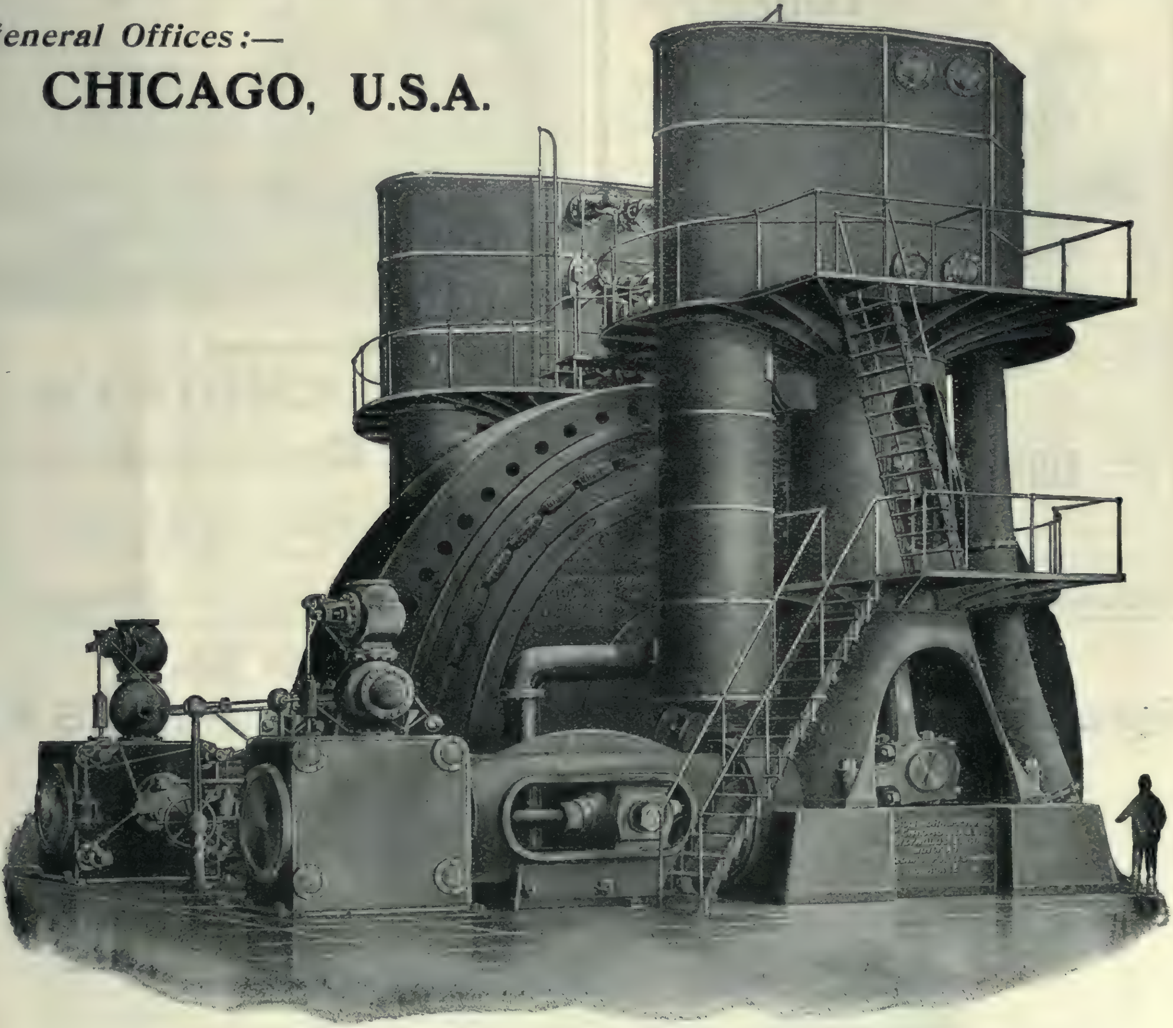

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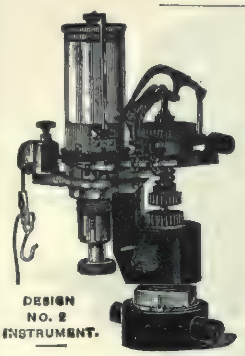

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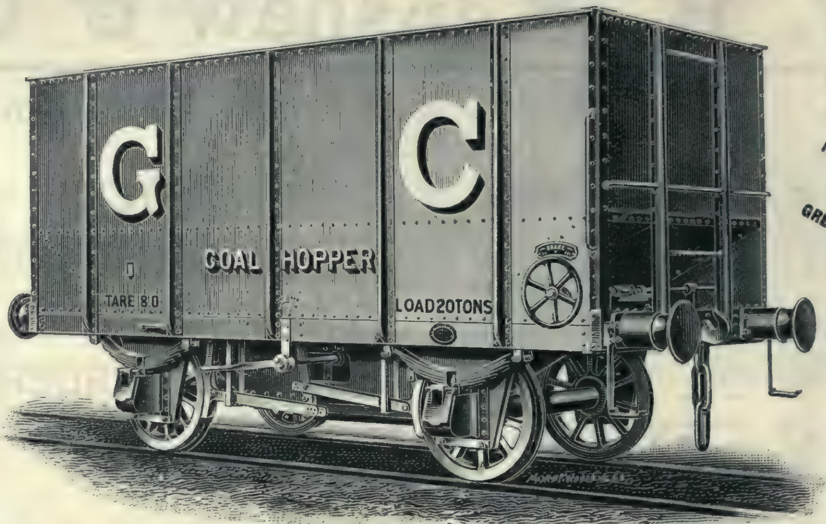

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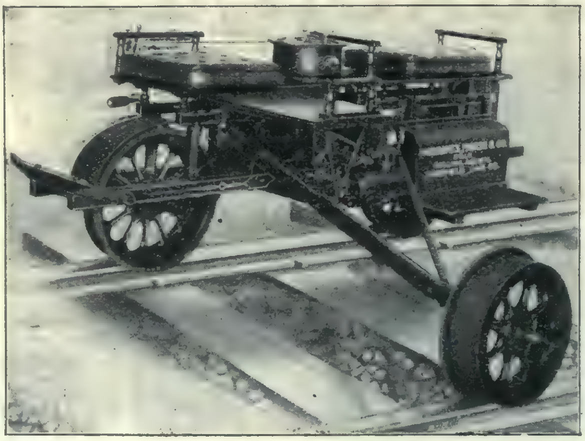

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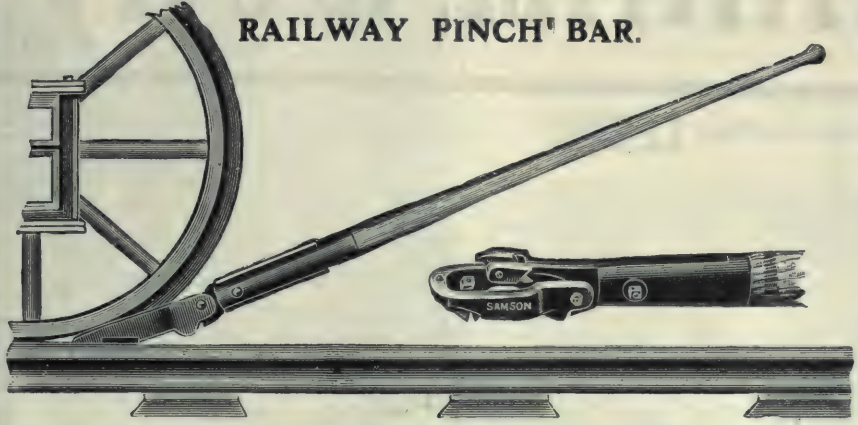
The "SAMSON."

RAILWAY PINCH BAR.



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& Co., Ltd.

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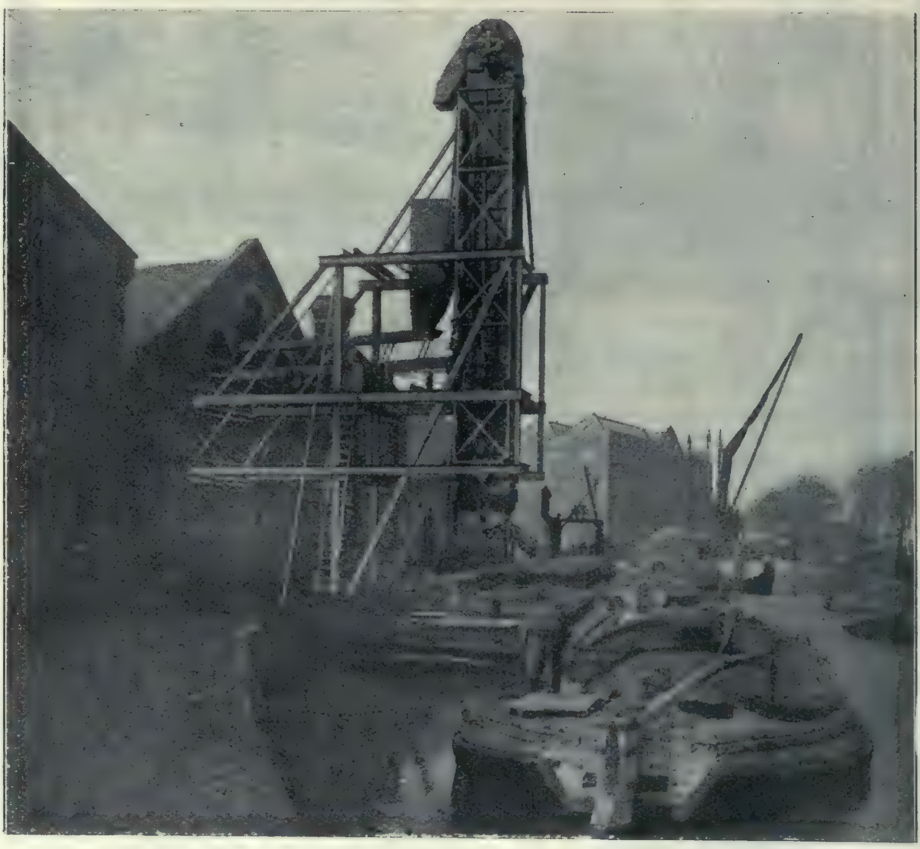

Photograph of a large Coal Unloading Plant erected by us.
We have erected many Plants similar to this design.

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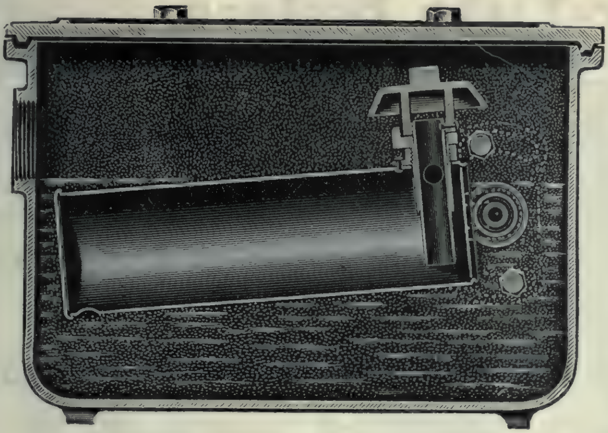
"THE LANCASTER" (R.T.M) 1903 PATENT STEAM TRAP



Though it has only been on the market a year, we have received over forty testimonials recording the splendid results and perfect satisfaction given by these traps.

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"With reference to your letter *re* the 1903 type of Steam Trap, the one you sent us as sample has given our customer **EVERY SATISFACTION.** Further, the twelve similar traps, which we had from you in June, are all at work and giving **EQUAL SATISFACTION,** and as a further proof of appreciation we enclose you an order for **24 MORE,** twelve of which we want delivered at once, and the remainder during the first week of November."

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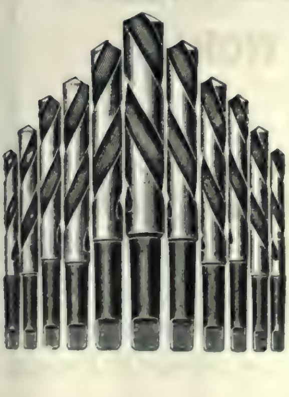

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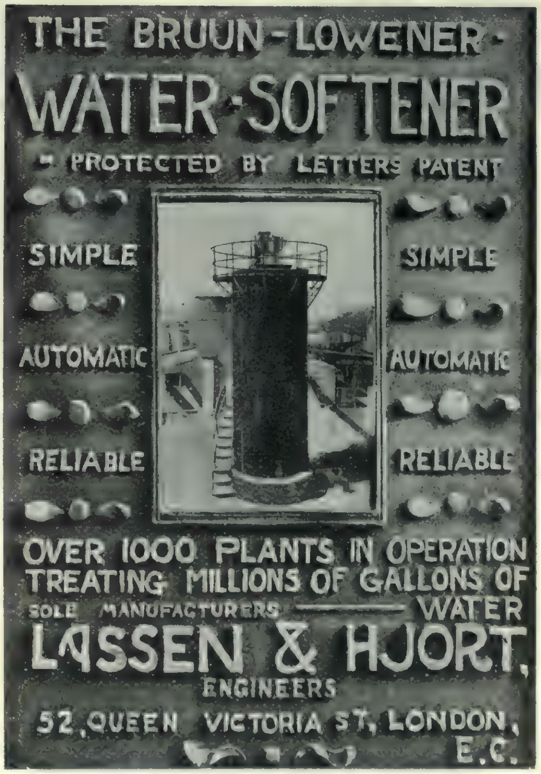

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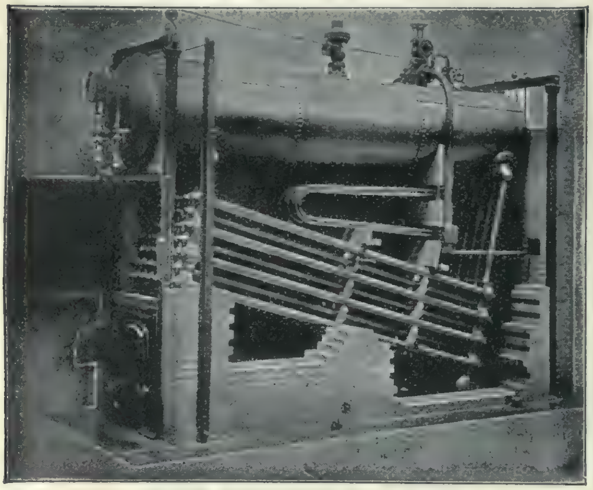

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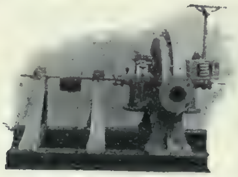

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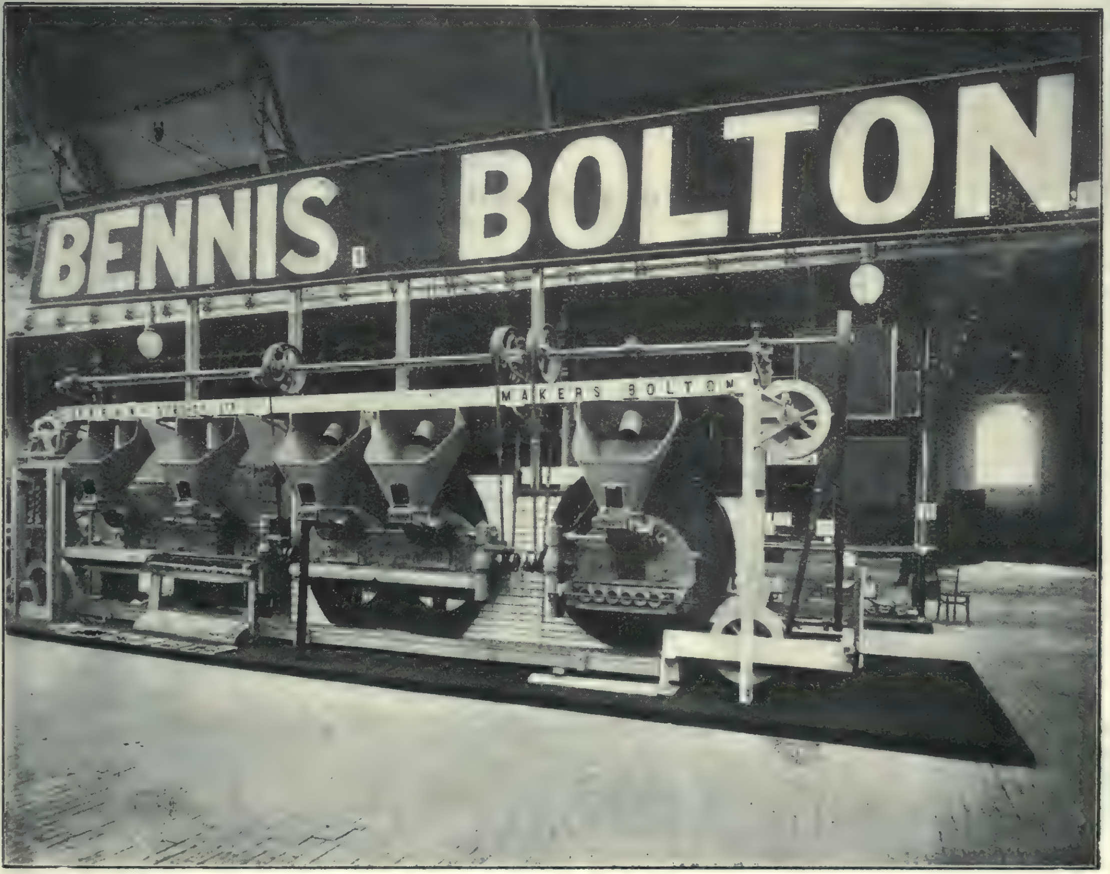

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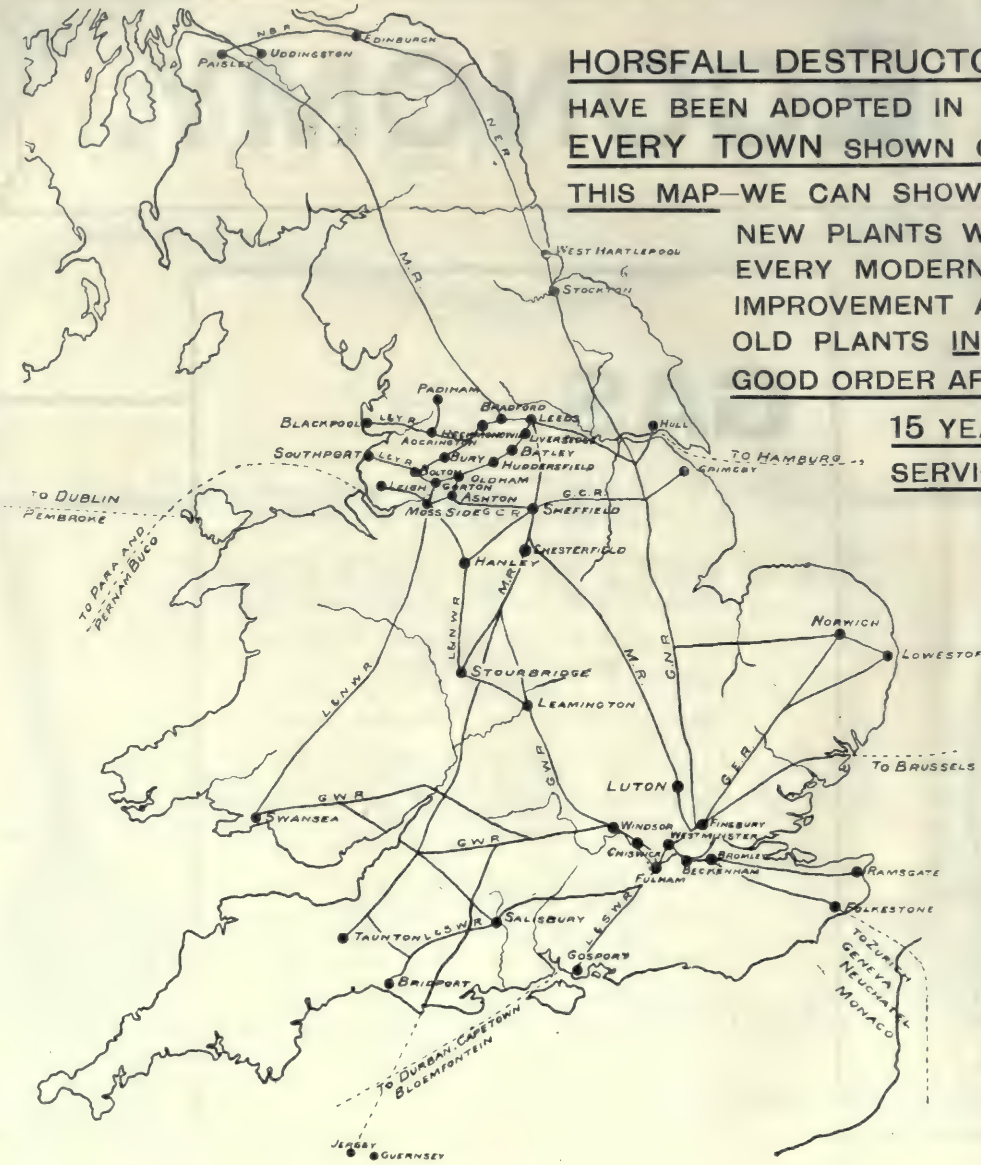

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THURSDAY	=	**14,850**	,, ,,
FRIDAY	=	**13,650**	,, ,,
SATURDAY	=	**14,540**	,, ,,
SUNDAY	=	**10,590**	,, ,,
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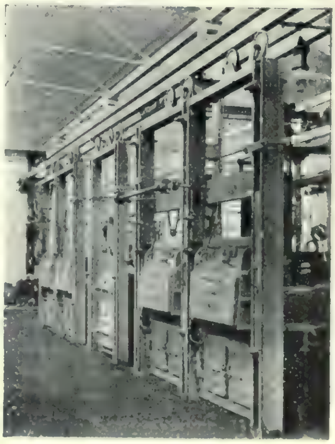
AVERAGE EVAPORATION FROM BOILER
10,000 lbs. per hour, from noon to midnight.

This illustration shows half the plant destined for Johannesburg erected in our shop before being shipped.



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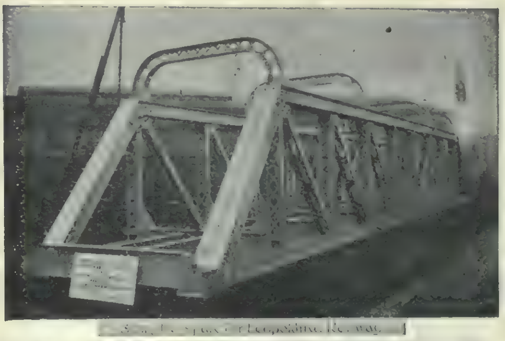

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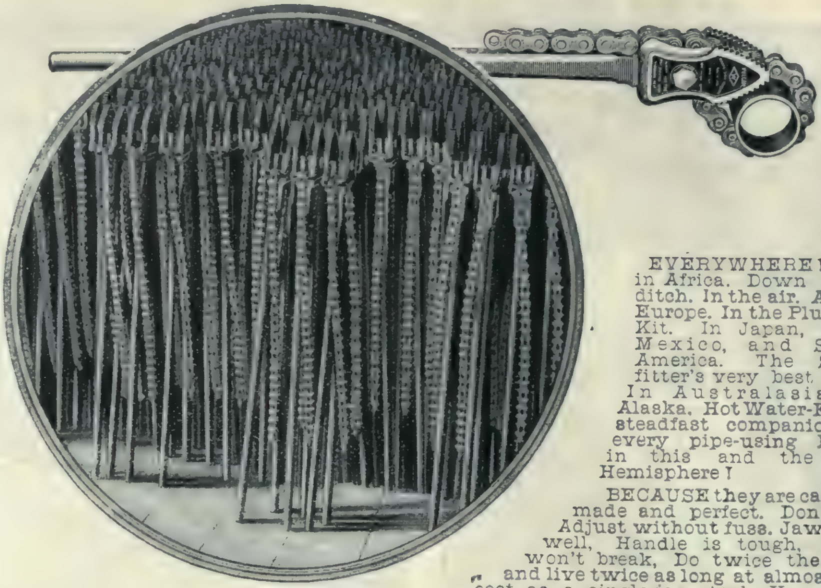

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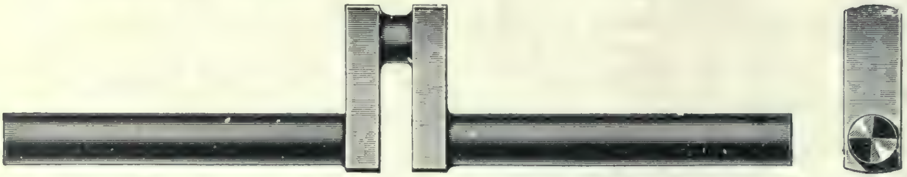

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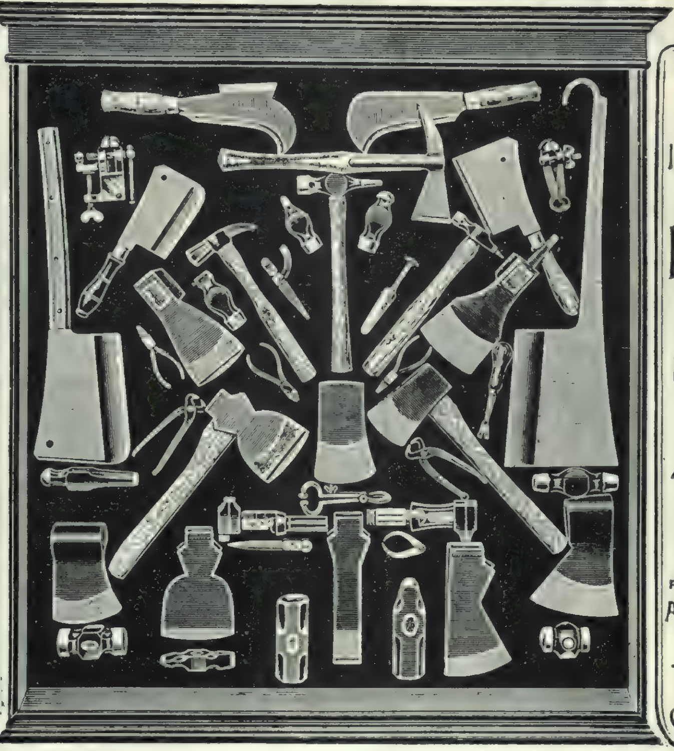

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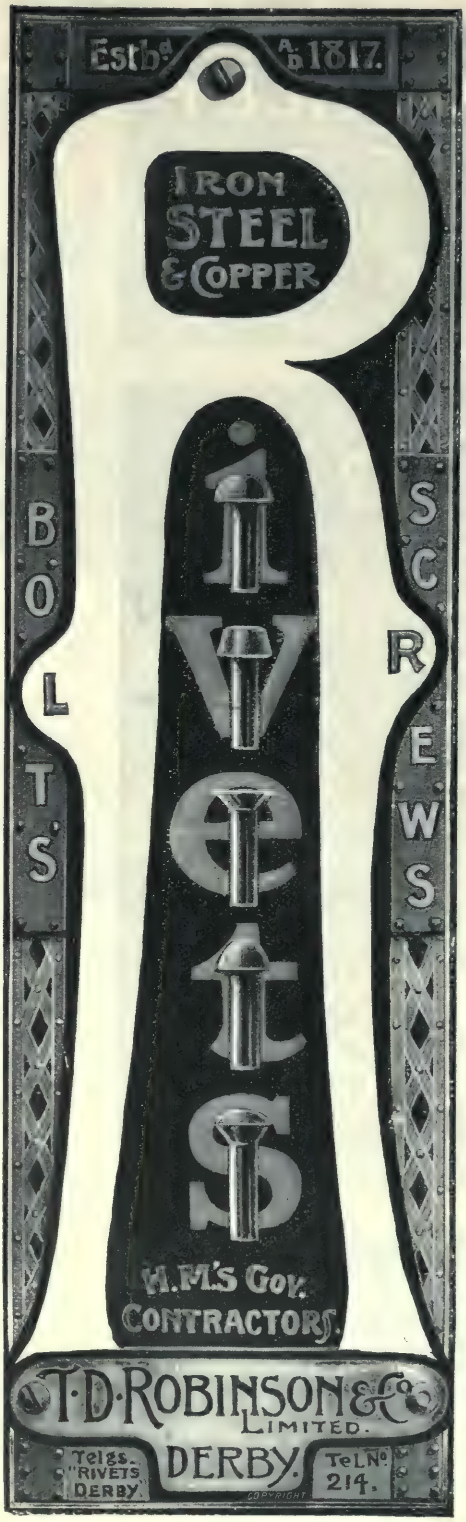

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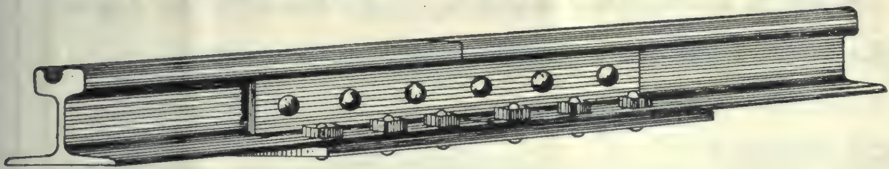

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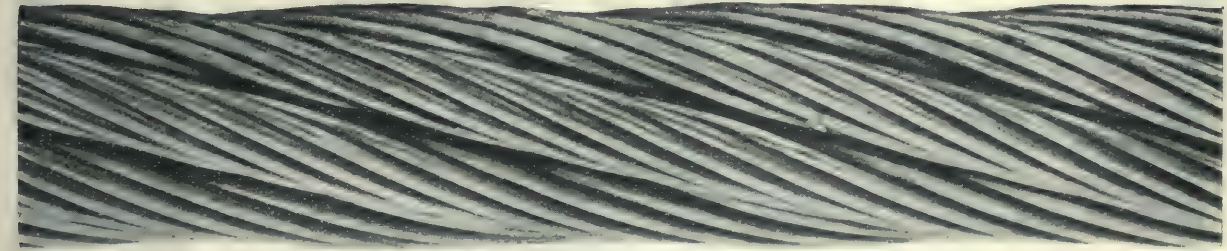

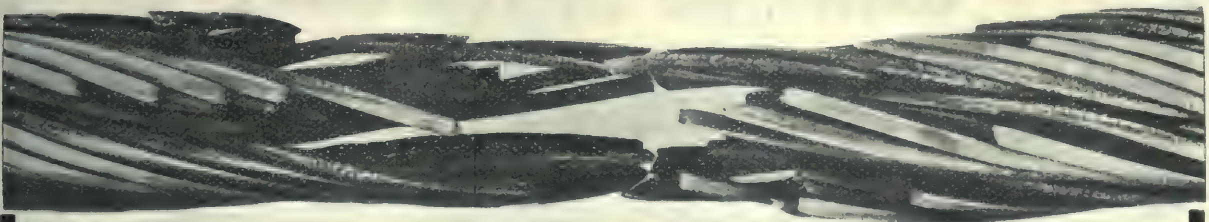

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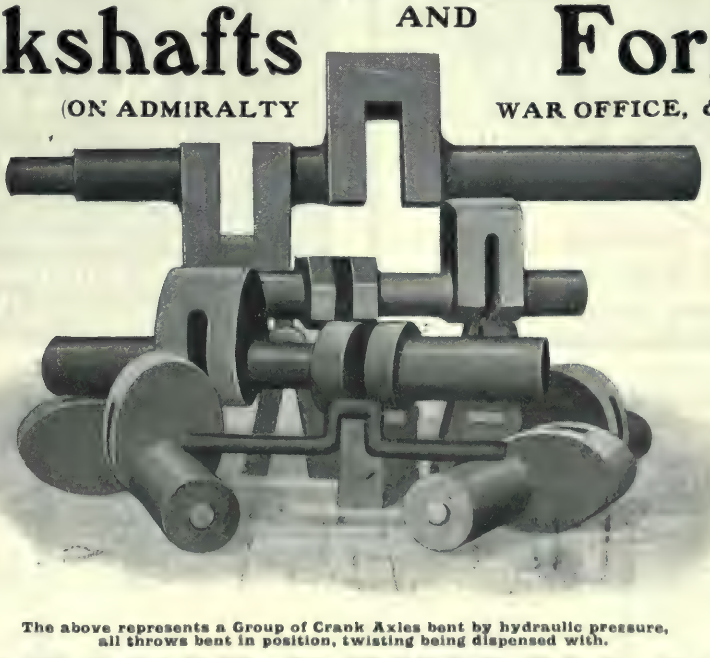
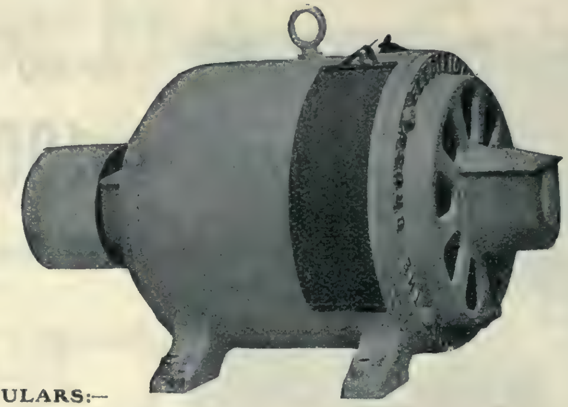


The above represents a Group of Crank Axles bent by hydraulic pressure, all throws bent in position, twisting being dispensed with.

WOODHOUSE & RIXSON, Sheffield.

PAGE'S WEEKLY Electrical Apparatus

BRUSH DIRECT-CURRENT MOTORS



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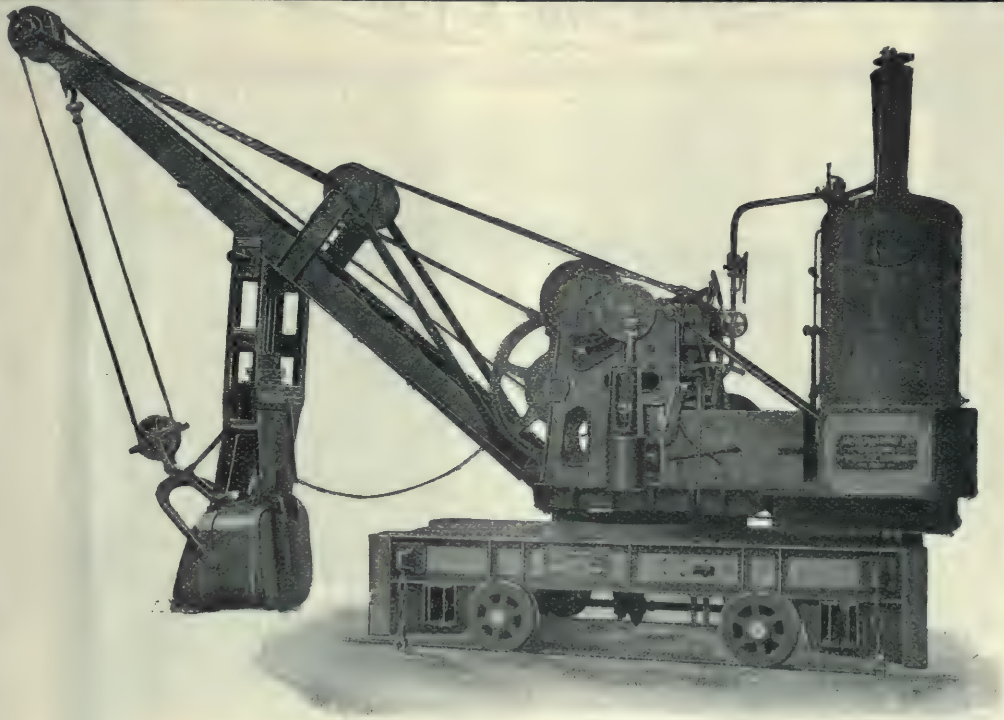

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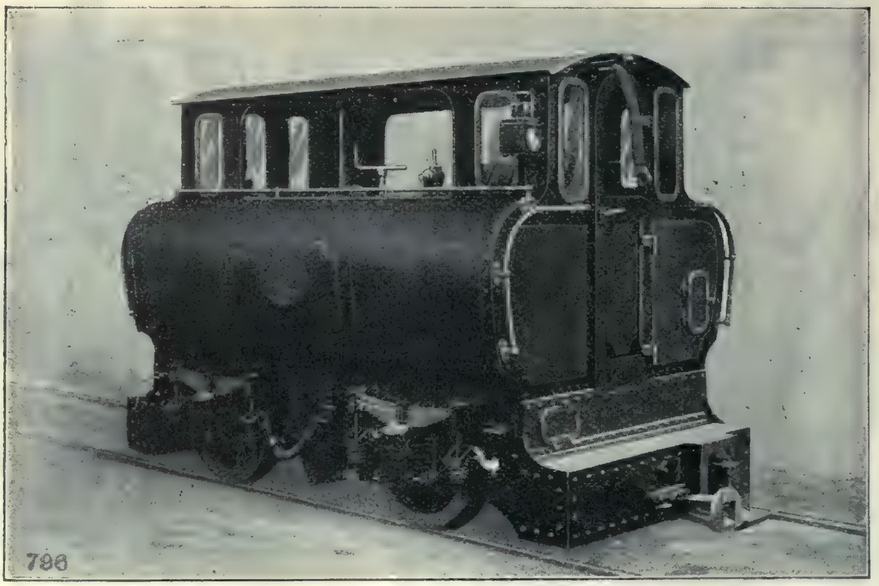

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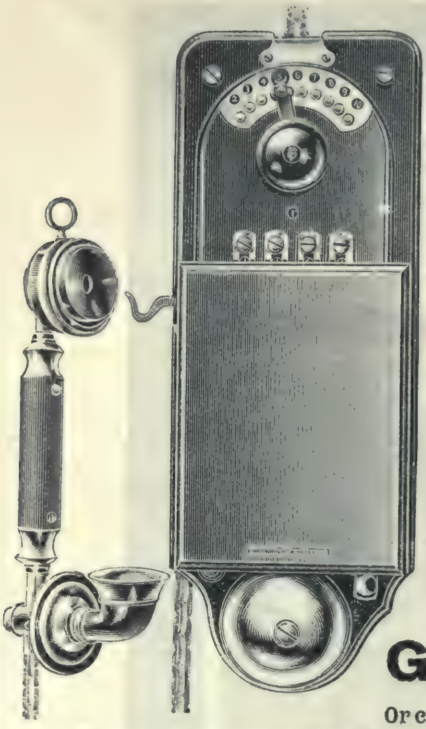

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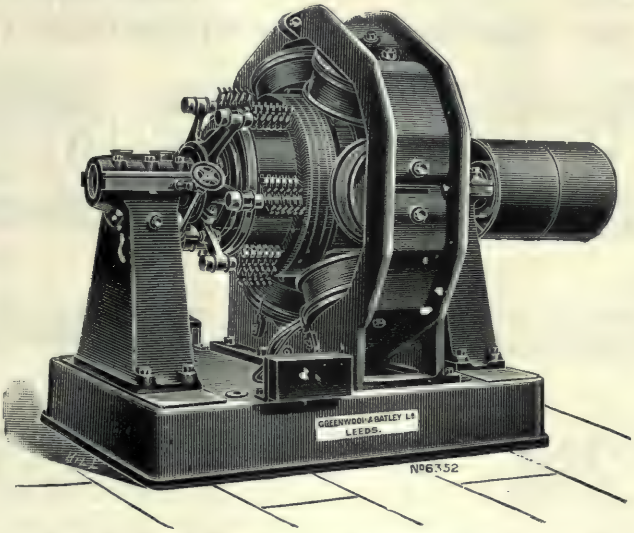

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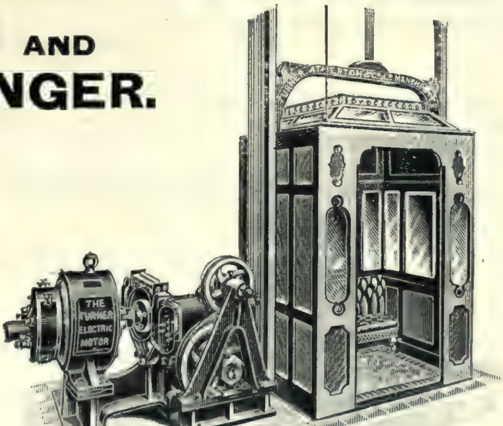

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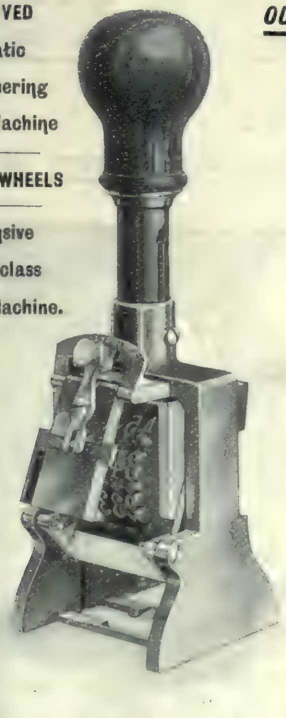

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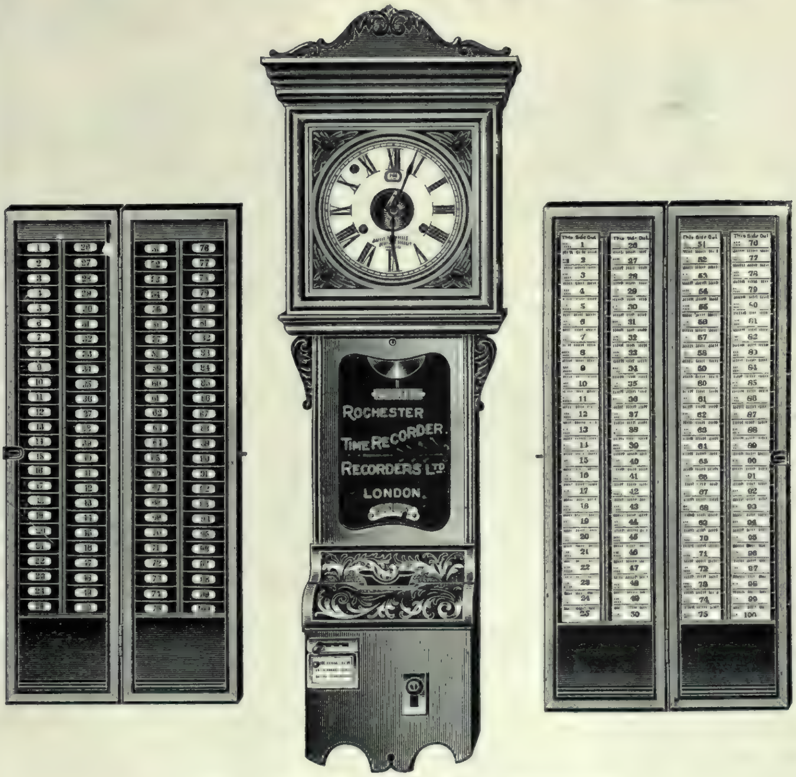
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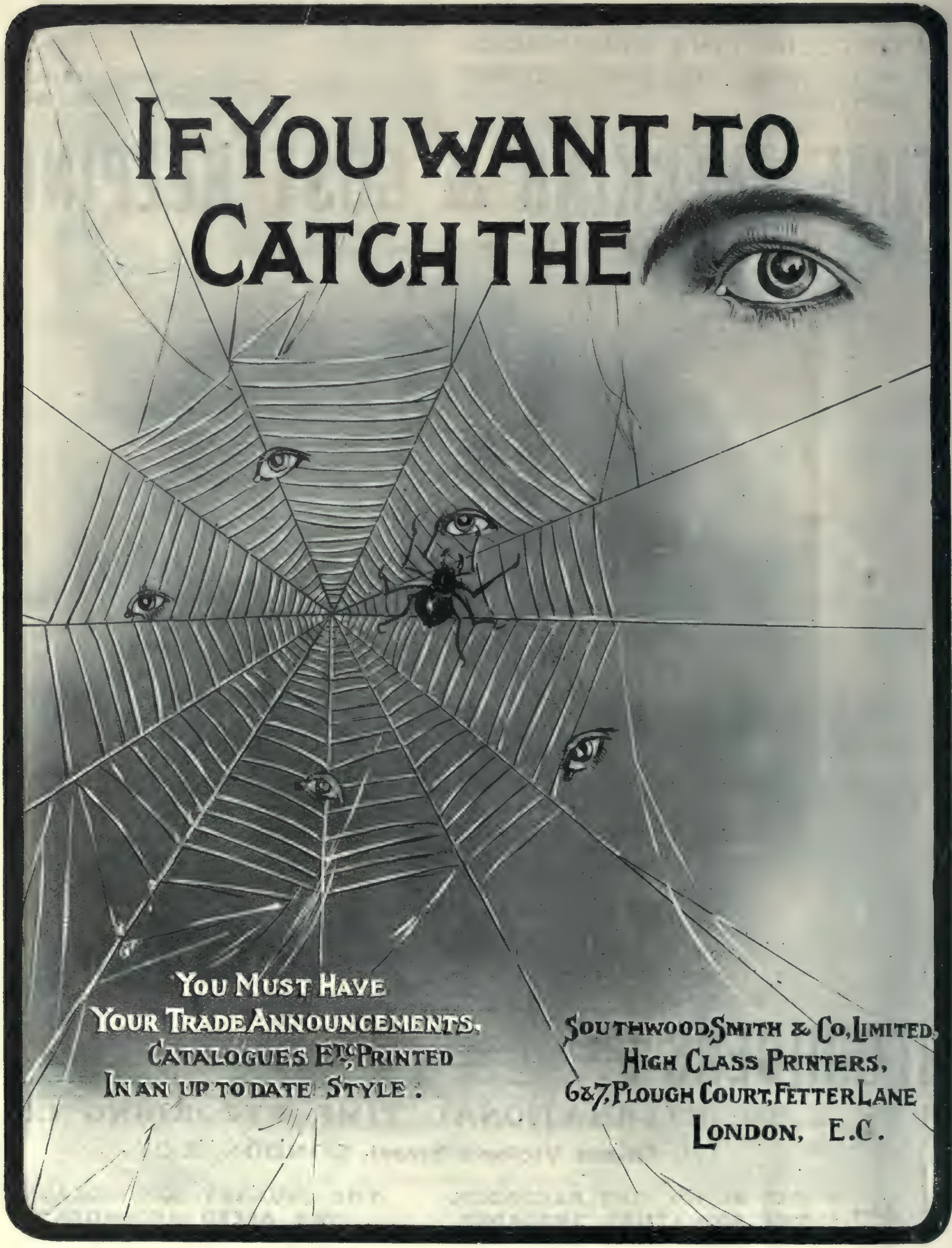

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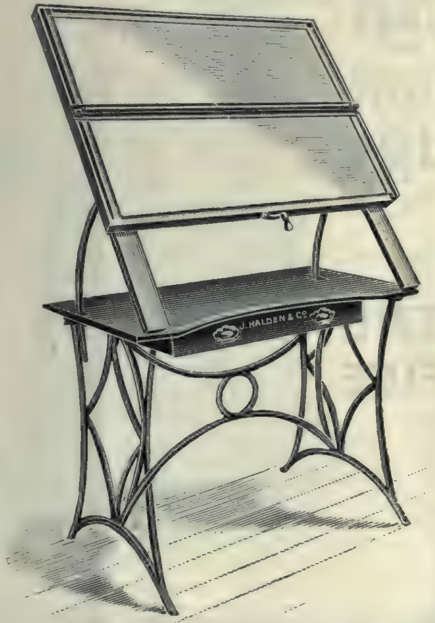

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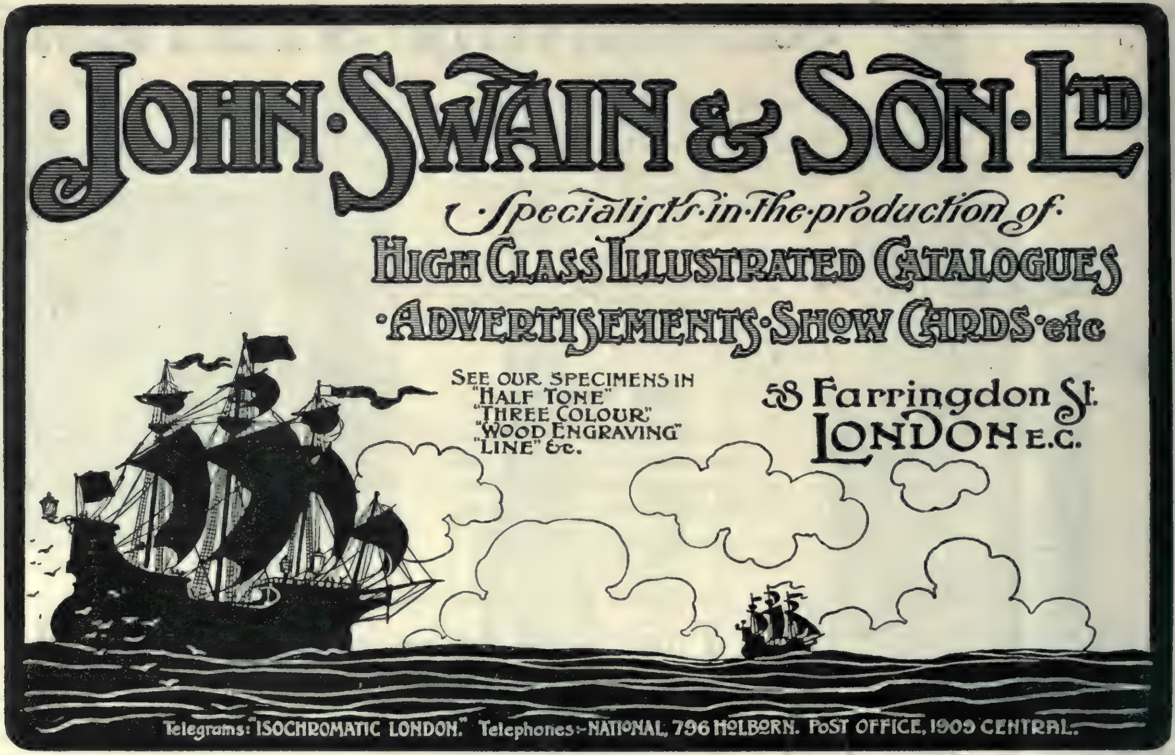

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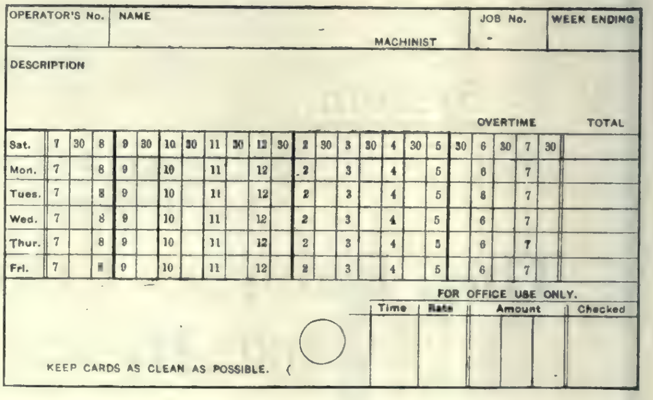

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Mon.	7		8	9		10		11		12		2		3		4		5		6		7		
Tues.	7		8	9		10		11		12		2		3		4		5		6		7		
Wed.	7		8	9		10		11		12		2		3		4		5		6		7		
Thur.	7		8	9		10		11		12		2		3		4		5		6		7		
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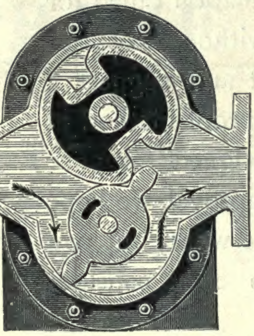

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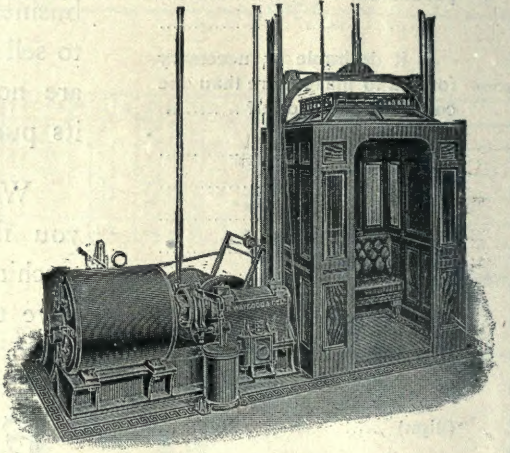

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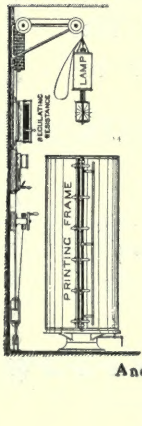

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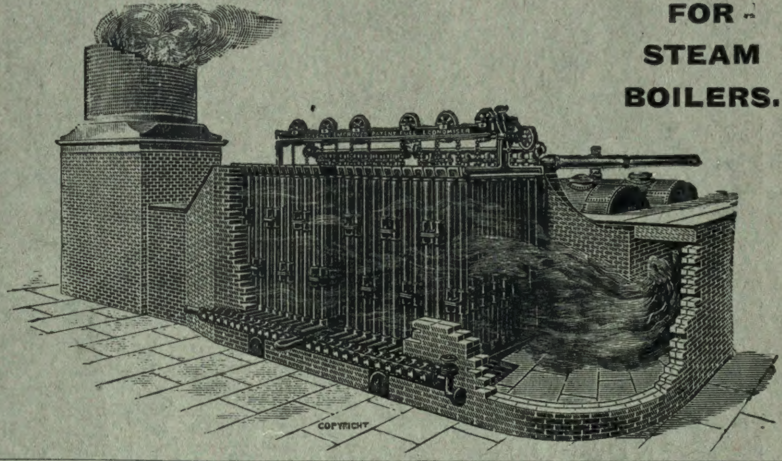

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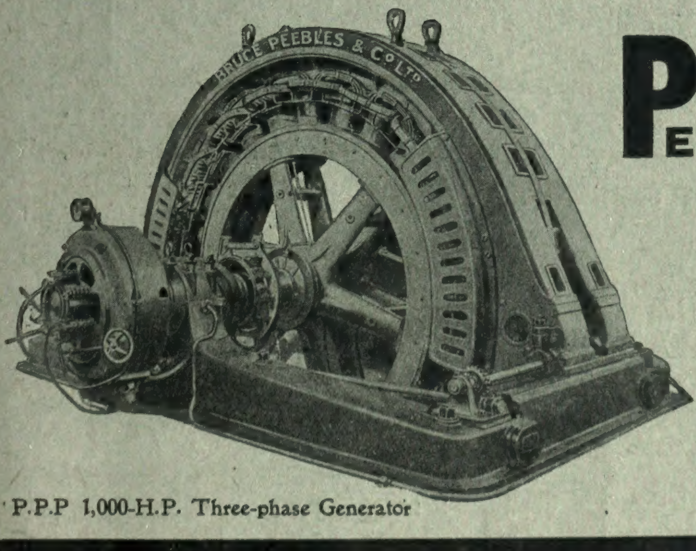

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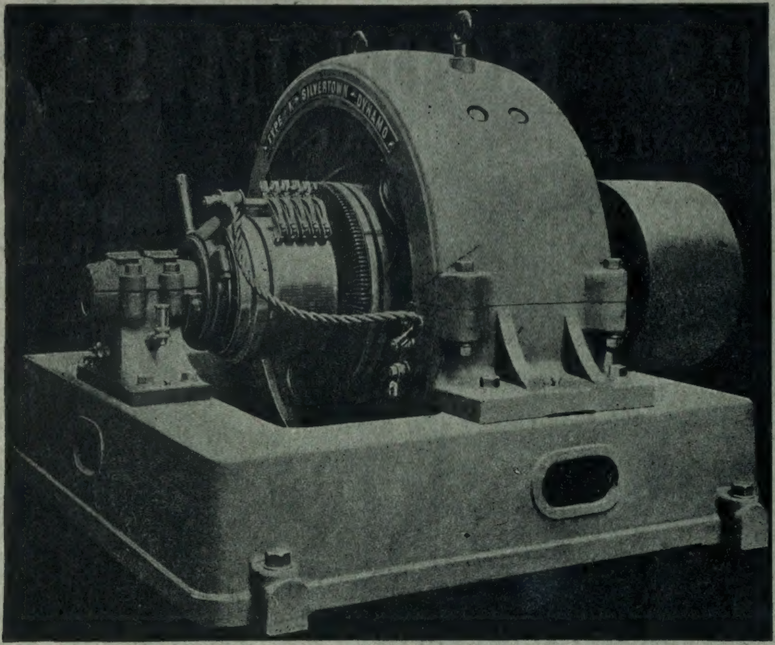

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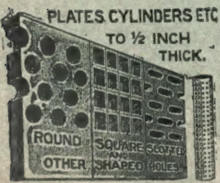

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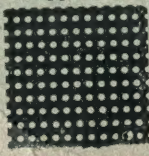

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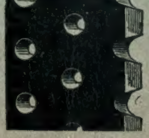

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